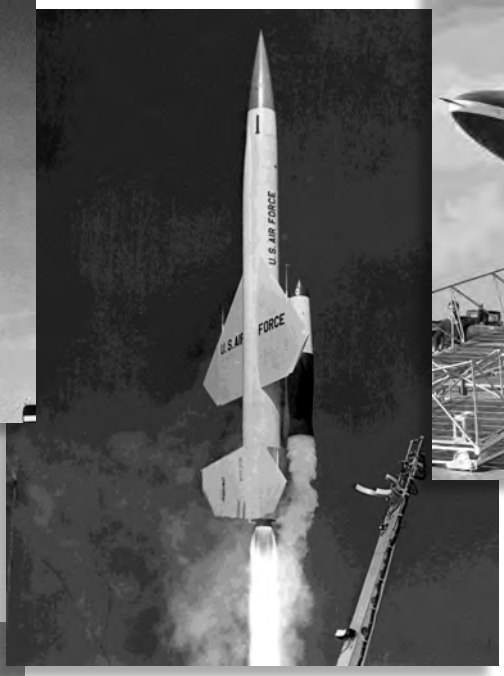
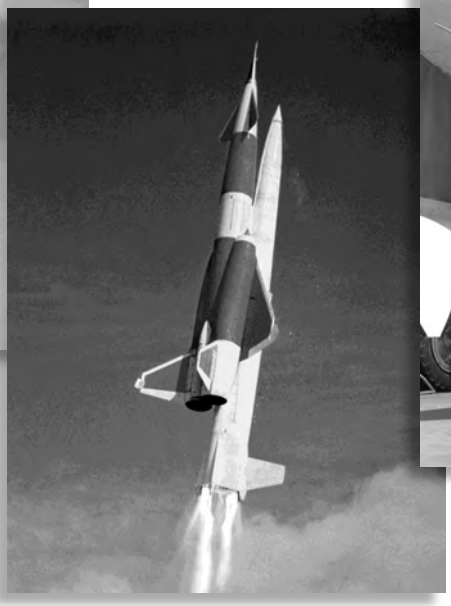
A Look Back...

WINGED MISSILES: 1950–1975

A Quarter Century Photo Retrospective





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WINGED MISSILES: 1950 TO 1975

The latter part of WWII and beyond saw a significant development in weapons technology. Among them, long range missile development. The Germans proved to the world that they could use the V-1 and V-2 rockets to strike targets from a long distance. After the war, the United States put forth a great effort to develop a similar technology. Using captured V-1 and V-2 rockets, American engineers duplicated and improved upon the German designs.

Before the use of the term 'cruise missile' became commonplace, most people referred to many long range systems of the era as 'Winged Missiles'. The definition of the term, "an unmanned self-propelled guided vehicle that sustains flight through aerodynamic lift for most of its flight path and whose primary mission is to place an ordnance or special payload on a target". Beginning in the 1950's, weapon systems such as the Martin *Matador* and *Mace*, Boeing's *BOMARC*, Northrop's *Snark* and North American's *Navaho* and *Hound Dog* became part of America's deterrence juggernaut.

As expected, after WWII, the Air Force demanded that contractors build these weapons with the nuclear mission in mind. As warheads became smaller and more potent, the missiles themselves became more aerodynamic with improved range and greater accuracy. The *Matador* and *Mace* fell under the control of the Tactical Air Command due to their shorter range and mobile design, the tactical strike mission was better suited for their capabilities. The 'TAC Missileers', a higher headquarters' moniker and a wink to their SAC counterparts, deployed to locations around the world including West Germany, Okinawa and Libya. By the time the Air Force retired the TAC missiles, Strategic Air Command had taken over the nuclear delivery role while Air Force Ballistic Missile Organization took over the ballistic delivery systems.

Not all winged missile systems were designed for ground targets. Getting in front of the Soviets, Boeing designed the *BOMARC* as a ramjet-powered, high speed interceptor that could cut off and kill Soviet nuclear bombers that the U.S.S.R. planed to field in the 1960's. Although the threat never fully materialized, the *BOMARC* stood guard from many locations across the United States and Canada for nearly two decades before being quietly retired. Their hardened launch stations abandoned and left to being forgotten landmarks of a bygone era.

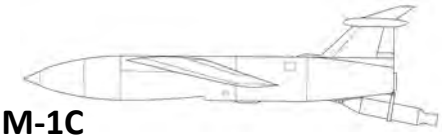
Northrop's *Snark* had a very brief operational career. Its first successful flight took place in April 1951, but SAC did not receive its first training missile until January 1958. Operational deliveries took place in May of the following year to the one and only operational *Snark* Squadron, the 702nd Strategic Missile Wing, Presque Isle Air Force Base , Maine. The unit reached its full operational capability in February 1961, and one month later President John F. Kennedy declared the *Snark* "obsolete and of marginal military value". The Air Force inactivated the unit on June 25, 1961.

Undoubtedly the most technologically challenging of the winged missiles, North American Aviation designed the *Navaho,* as a rocket-boosted, ramjet-powered Mach three nuclear delivery system of the future. Beset with technical challenges, system delays and cost overruns, the weapon system never became operational. Despite having some successes, the system encompassed too much state-of-the-art technology to become a reliable delivery system with many of the missiles ending up as target drones for *BOMARC* testing. Though the missile system itself was not considered a success, many of the design elements such as metallurgy, canard configuration and navigation systems went into the XB-70 *Valkyrie* and *Hound Dog* missile.

North American Aviation's *Hound Dog* could be considered the first true 'cruise missile'. With turbojet power and nap of the earth navigation, SAC carried the *Hound Dogs,* one under each wing, aboard its specially modified Boeing B-52's. In nuclear combat, SAC aircrews would release the missile at an altitude of 45,000 feet, which would climb beyond 56,000 feet and cruise at Mach 2 to its target over 700 miles away. After 15 years of operational service, the Air Force removed the *Hound Dog* from alert deployments in June 1975 and the last one delivered to retirement storage 3 years later.

As the *Hound Dog* reached its retirement, a new generation of cruise missiles came on line to replace them. The AGM-86 series of Air Launched Cruise Missile (ALCM) as well as the AGM-129 and AGM-158 were small, subsonic , internally carried, and could be armed with nuclear or conventional warheads. The age of the true 'winged missile' was over but their legacy lives on in a new generation of advanced cruise missile technology.

MARTIN MATADOR



MX-771, B-61A, QB-61A, TM-61A/C, MGM-1C

Top: A large missile for its day, the Martin B-61A *Matador* measured over 39 feet in length.

Middle: Launch of the first XSSM-A-1 *Matador* prototype occurred at White Sands Missile Range, New Mexico in January 1949.

Bottom: Safety chase pilots flying in the Lockheed T-33 and Republic F-84 remain cautiously distant to the unpiloted test missile.

Top and Bottom: With initial test launches performed from a concrete hard stand at the Missile Test Center, latter launches made use of a specially designed mobile platform.

Top: Early test missiles sported high visibility paint schemes.

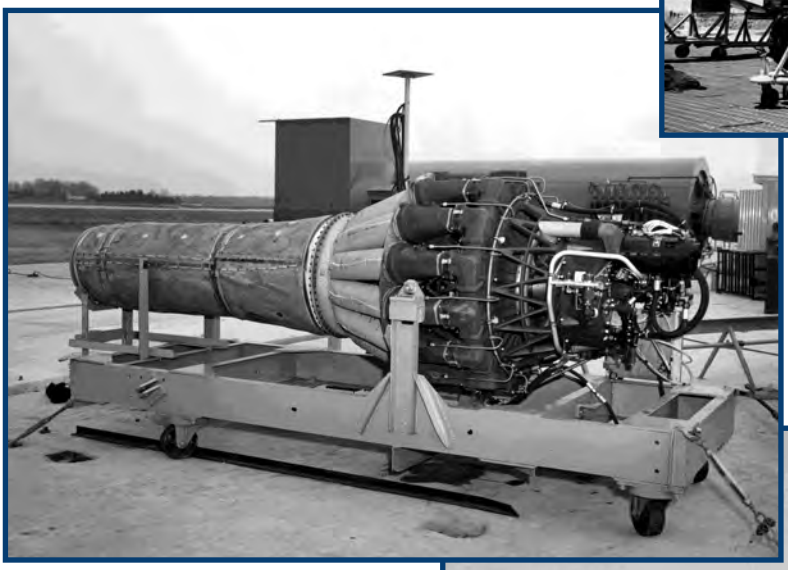
Middle: The launch area was remote with very tight security.

Bottom: RATO bottle jettison after takeoff.

Top: Production area at the Martin facility with *Matador* missiles coming off the line at an impressive rate. By mid-1957, Martin had delivered over 1,000 missiles.

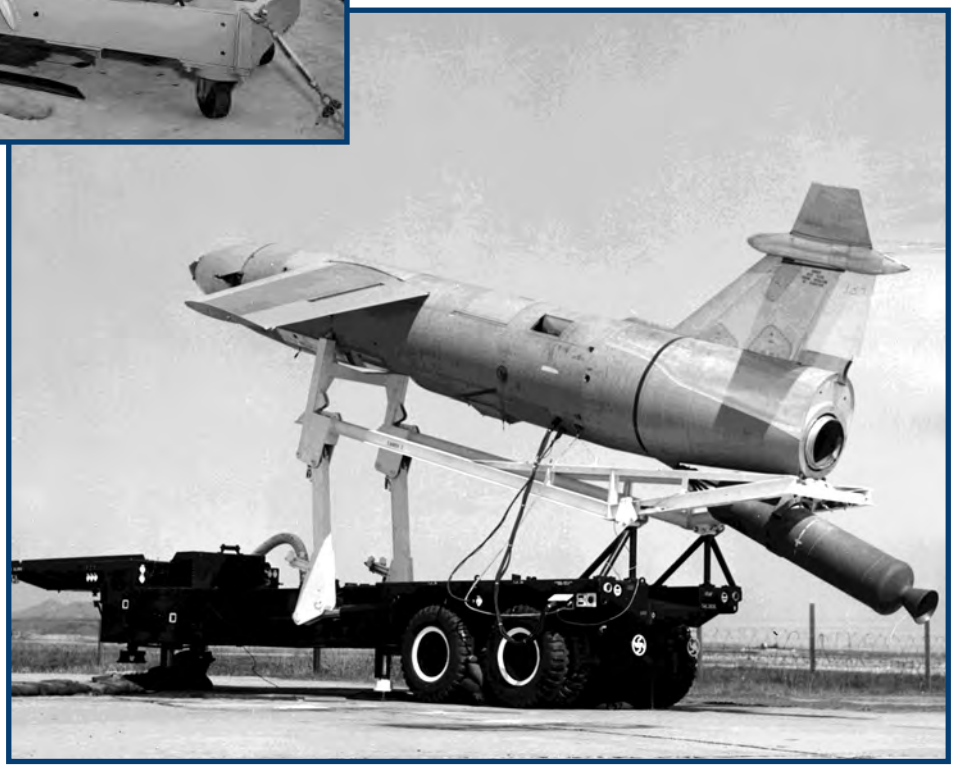
Bottom: With assembly complete and basic systems tested, the missiles could be disassembled and loaded into crates for shipment to their respective bases.

Left and Below: *Matador* missile components were shipped separately and reassembled upon delivery. Assembling one of the missiles in the field could be laborious and challenging due to the limited resources at hand.



Left: The primary powerplant for the *Matador* missiles, an Allison J33-A-37 turbojet engine producing 4,600 pounds of thrust.

Right: With assembly complete, the *Matador* was placed on its mobile launcher and the Aerojet General Rocket-Assisted-Take-Off (RATO) unit attached.



All: Test launches of the B-61A *Matador* took place day and night from the test facility at White Sands Missile Range in New Mexico.

All: In addition to the bright colors, some of the *Matador* test missiles were given elaborate striped paint schemes to assist with long range tracking.

Above: Under the control of Tactical Air Command, the 'TAC Missileers' stand ready inside the launch control room awaiting launch orders.

Right: Security was paramount for the nuclear-armed missiles at the various operating locations around the world.

Top: Tactical Air Command *Matador* missile crews and leadership pose with their nuclear-armed winged units of deterrence. These men became known as the 'TAC Missileers'.

Left: With a North American F-100 *Super Sabre* approaching from behind, the TM-61 Matador with its J33 engine running, is ready for launch.

Below: TM-61 *Matadors* on parade in West Germany.

Above: Not all *Matador* launches went as planned. This missile ended up with moderate damage when it tipped over on its nose prior to launch.

Above: *Matador* missiles must have been a curious site to the local population during overseas deployments.

Left: As a mobile platform, *Matador* launch sites could take place virtually anywhere there was room to launch.

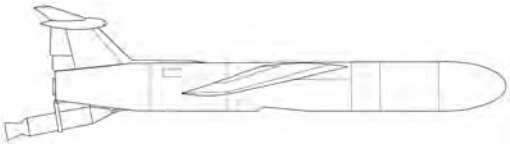
Above: Does this photo really need a caption…

Left: Proud 'TAC Missileers' pose with their *Matador* which is adorned with nose art and signed by the entire crew.

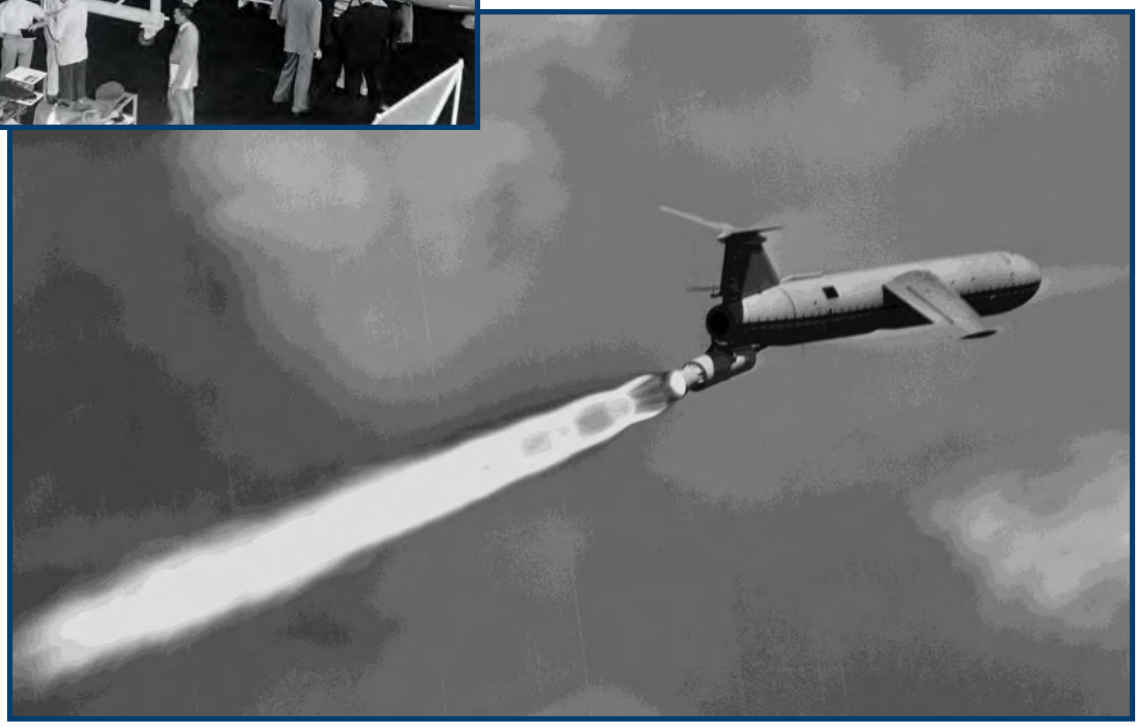
Below: The TM-61B *Matador* and MM-1 Teracruzer debuted on January 21, 1957. The upgraded TM-61B eventually received the designation TM-76 *Mace*.

MARTIN MACE

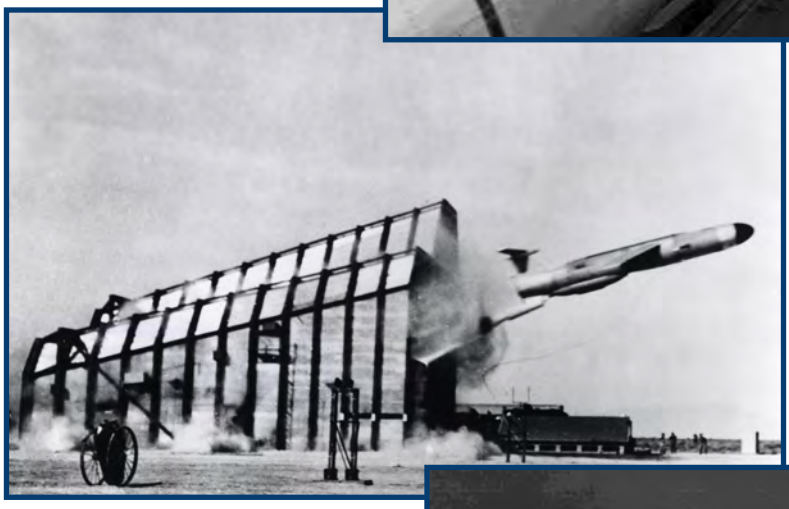
MX-771, TM-61B, TM-76A/B, MGM-13A/B, MQM-13A/B, CGM-13B



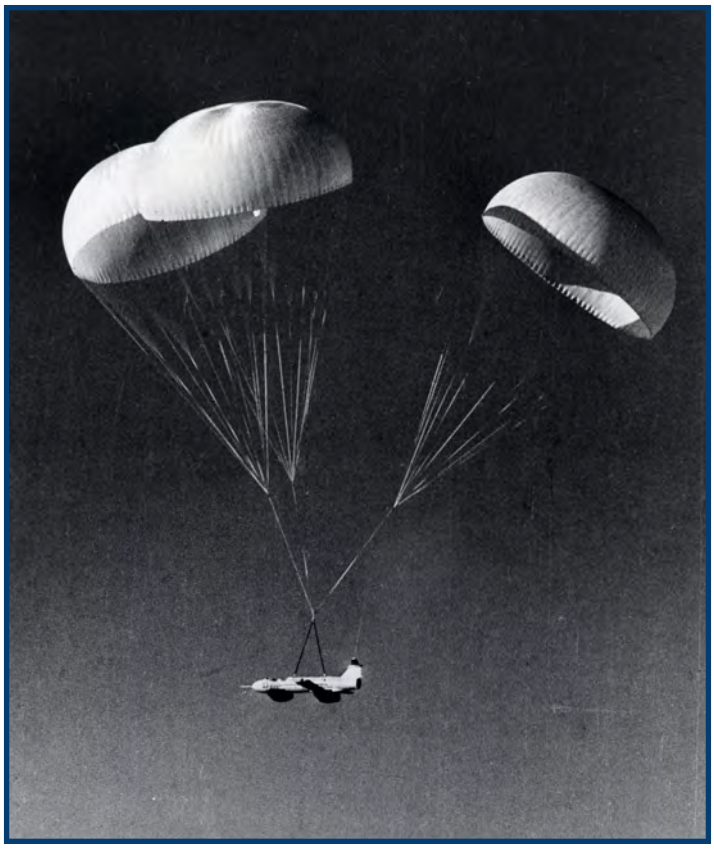
All: Extensive modifications and upgrades to the TM-61 *Matador* led to the development of the TM-76 *Mace*. With its larger payload, longer range, better reliability and ease of assembly, the *Mace* quickly replaced the previous design.

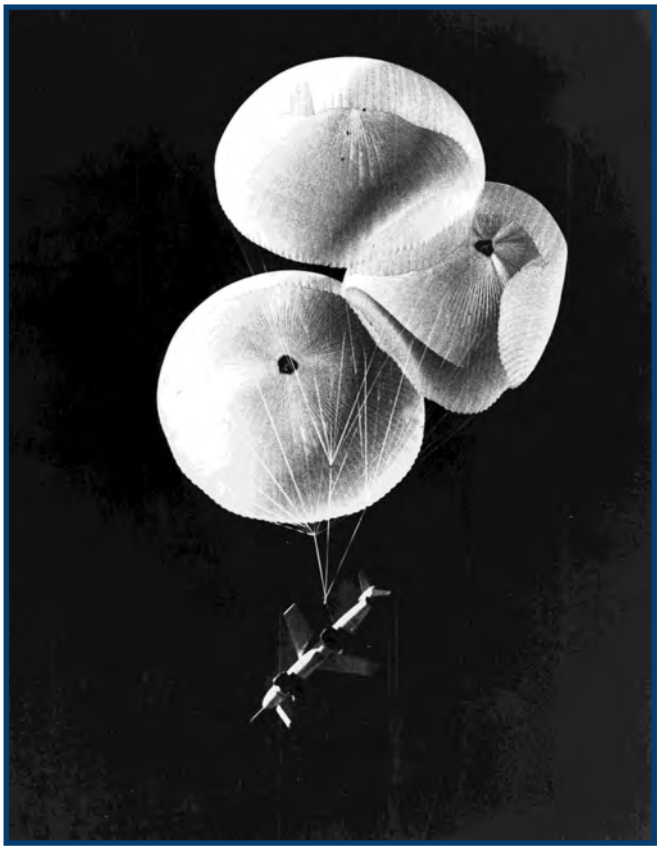


Right: The Martin production line made a smooth transition from the *Matador* to the *Mace* missile. With some commonality between the two, many of the production line jigs could be repurposed for the new design.



Left and Below: The *Mace* missiles improved reliability and longer range allowed for the testing from fixed sites and enclosed shelters.



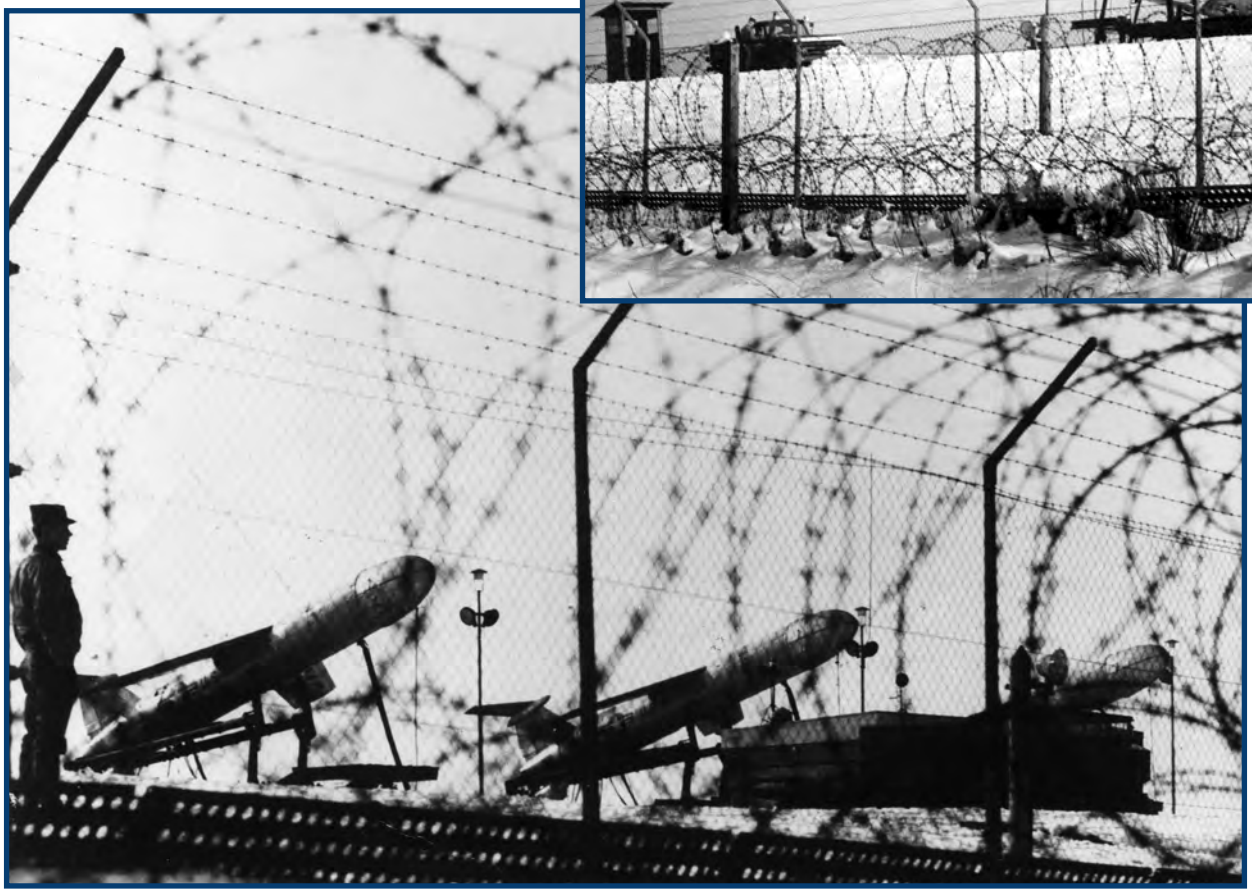


All: Minimal modifications by replacing the payload with a parachute system made several of the *Mace* test missiles recoverable to be used for testing on more than a single mission. Inflatable bags on the bottom of the vehicle softened the impact of the desert landings.

Above and Left: *Mace* missiles could be deployed and launched from fixed locations or deployed to the field as needed.

Right: The nuclear deterrent combination of Tactical Air Command's *Mace* missile and Strategic Air Command's B-52 *Stratofortress* made any hostile nation think twice before attacking the United States or its allies.

All: The *Mace* missiles designation changed from TM-76 to MGM-13 early in the production run. One of the many upgrades from the *Matador* system, the Thiokol solid-rocket booster unit capable of 100,000 pounds thrust. The *Mace* also used the upgraded Allison J33-A-41 turbojet engine for its cruise flight to the target.

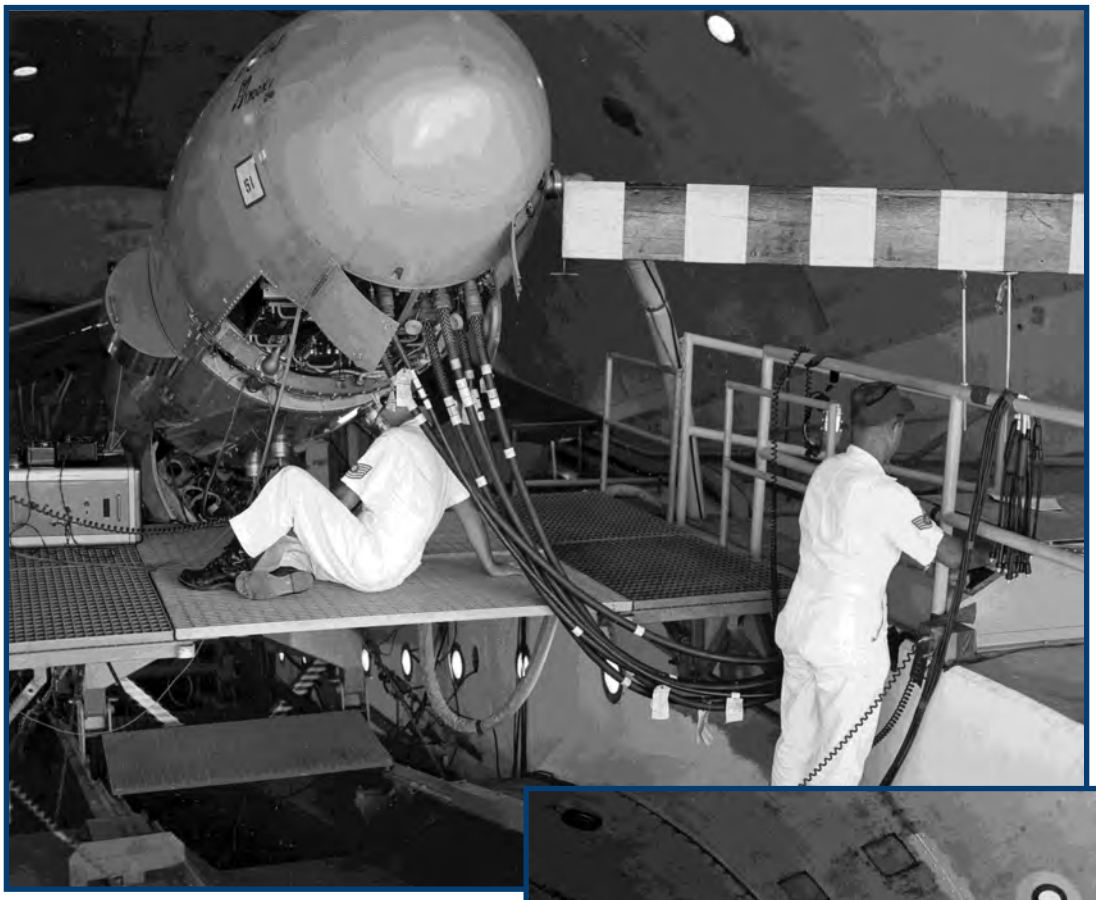


All: The MGM-13A *Mace* missiles stand alert on their transporter erector launchers. The outdoor sites were protected with tight security and barbed wire fencing. Every person entering the compound was searched prior to entry.

Above: These 'A' model variants of the MGM-13 *Mace* utilized the Automatic Terrain Recognition and Navigation (ATRAN) terrain-matching radar system for low-level flight to the target area.

Below: The *Mace* missiles had been designed with field maintenance in mind which made them much easier to work than their predecessor.

All: The *Mace* missiles incorporated folding wings for transport. The TM-76B, later designated as MGM-13B, had increased range and utilized inertial navigation systems. The 'B' models also utilized hardened, underground bunkers.



Top: Performing routine maintenance inside the enclosed shelters became a much easier task than outdoors in the field. Note the white coveralls worn by the enlisted technicians.

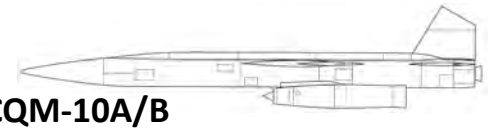
Above: The tradition of carrying nose art was continued on the Mace missile program.

Left: The Tactical Air Command emblem clearly visible on the tail of this MGM-13B as the technician performs routine checks on the horizontal stabilizer.

Top: An MGM-18B *Mace* missile is launched from its hardened shelter.

Right: Many of the *Mace* missiles ended up as target drones after program termination due to their size and performance similarity to modern aircraft.

BOEING BOMARC



MX-1599, F-99A, IM-99A, CIM-10A/B, CQM-10A/B

Top: First flown in 1952, the Boeing *BOMARC* (BOeing Michigan Aerospace Research Center) originally carried an F-99 designation, but this changed three years later to IM-99. The XF-99 shown above had the vertical stabilizer on the bottom and did not yet incorporate the ramjet engines for cruise flight.

Right: The first of 570 production *BOMARC* missiles (269 IM-99A's and 301 IM-99B's) rolls off of the Boeing production assembly line. Unlike its winged missile predecessors, *BOMARC* was designed to intercept incoming enemy aircraft.

Top: The first production *BOMARC* being prepared for shipping.

Left: With assembly and testing completed, the missiles are loaded into a Douglas C-124 *Globemaster II* for delivery.

Bottom: A variety of aircraft including this highly modified F-94B *Starfire* and B-57B *Canberra* carried out *BOMARC* system tests.

Left: *BOMARC* missile being launched from the Santa Rosa Island test facility. The Santa Rosa Range Complex is part of Eglin AFB, Florida overwater range.

Middle: During a *BOMARC* launch attempt at Cape Canaveral, Florida on March 5, 1960, the missile caught fire at Launch Complex 4 (LC-4) and is destroyed.

Bottom: IM-99A missiles lined up in the Florida hangar ready for testing.

Right: Caught by the camera at the moment the liquid-filled booster ignites, *BOMARC* test missile number 14 departs the launch area during a test mission. The IM-99A liquid booster became a source of serious corrosion and several dangerous close call incidents. Solid rocket boosters replaced the liquid-fueled boosters on the IM-99B.

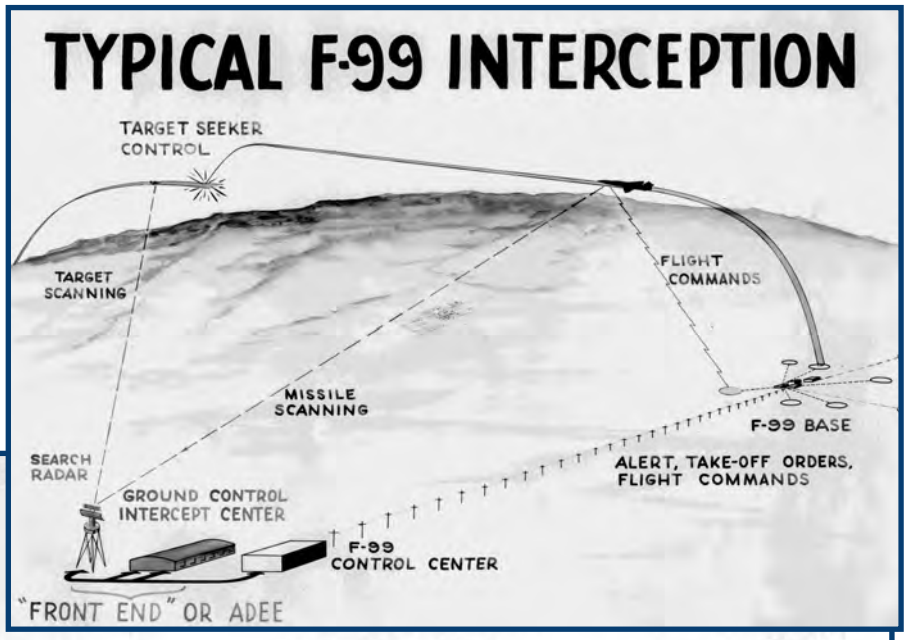
Middle: Enlisted technicians perform necessary maintenance on the IM-99A.

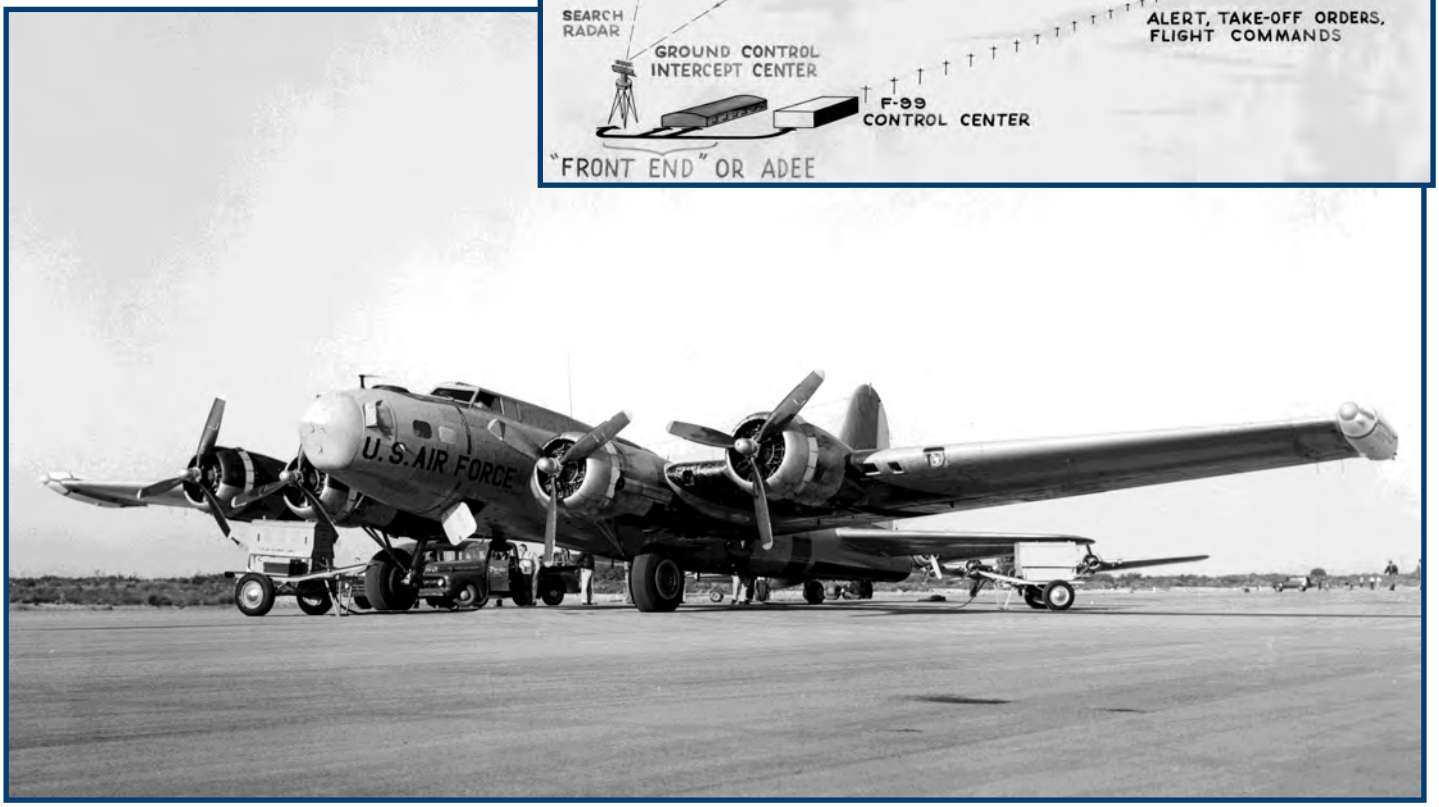
Right: In a less politically-correct era, aircraft manufacturers often used attractive young women to market their product. Shown here, 'Miss BOMARC' poses with a large model of the vehicle.

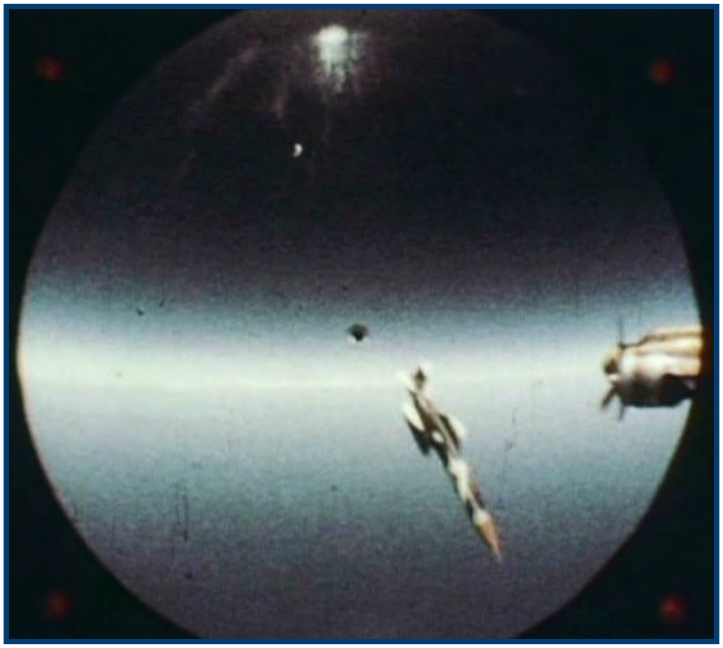
Above: Dramatic view of an IM-99A *BOMARC* leaving the launch pad at LC-4, Air Force Missile Test Center, Cape Canaveral, Florida on October 29, 1959.

Right: This artwork predates the SAGE network showing the command and control segment originally developed for *BOMARC.*

Below (3 photos): QB-17 target drones initially used for intercept missions of *BOMARC*. Onboard wing tip cameras capture the moment when the missiles would have detonated, destroying the aircraft.







Left: Maintenance technicians install one of the Marquardt RJ43-MA-3 ramjet engines used to power the *BOMARC*.

Right: This IM-99 *BOMARC* missile sports a unique white paint scheme as it's launched from LC-4, AFMTC , on December 13, 1958.

Left: The interceptors that defended North America during the 1950's and early 1960's included Canada's Avro CF-100 *Canuck*, Boeing IM-99A *BOMARC* and the Convair F-102A *Delta Dagger.*

Left: Corrosion and safety issues on the IM-99A pushed for the upgrade to the solid-rocket boosted IM-99B '*Super BOMARC*'. The new design also received the upgraded Marquardt RJ43 -MA-7 ramjet engines. The new solid booster took up less space inside the missile which left room for more ramjet fuel, increasing the range to 430 miles.

Right: During intercept testing a *BOMARC* missile passed within kill distance of a North American X-10 target traveling at Mach 2 and 48,000 feet on October 2, 1957. While its stated cruise speed is Mach 2.5, the B model had been tested to speeds of Mach 4 and effective from sea level to 100,000 feet. On 23 March 1961, a Bomarc B successfully intercepted a *Regulus II* target missile flying at 100,000 feet, thus achieving the highest interception in the world to date.

All: In September 1958, the Air Force announced plans to move *BOMARC* testing from the AFMTC at Cape Canaveral to the Air Proving Ground Center at Santa Rosa Island near Eglin AFB, Florida.

Above: Activated March 25, 1959, the first operational *BOMARC* unit, the 46th Air Defense Missile Squadron, operated from a remote site at McGuire Air Force Base, New Jersey.

Right: Hangar facilities for the IM-99 missiles under construction at McGuire AFB. These units became known as 'coffins' due to their unique shape.

Above and Below: Four IM-99B *BOMARC* missiles are raised to their launch position.

Above: A nice view of the missile in its raised position from inside the coffin. Note the red inlet and exhaust covers over the ramjet engine and pitot tube on the wing.

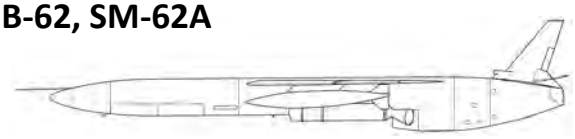
Right: *BOMARC* was integrated into the centralized command-and-control air-defense system for Canada and the United States, known as SAGE (Semi-Automatic Ground Environment). The control center Kingston, New York Air Defense Sector, Maj John Hassard (seated) and Capt Arnold Mackeen, ready to launch a *BOMARC* from the AFMTC at Cape Canaveral, Florida in December 1958.

Left and Below: The placing of the *BOMARC* missiles in Canada became a highly controversial decision. The Progressive Conservative government of Prime Minister John Diefenbaker initially agreed to deploy the missiles, but it was unclear if nuclear warheads would be allowed. All nuclear warheads were stored separately and under control of Detachment 1 of the USAF 425th Munitions Maintenance Squadron. During operational service, the *BOMARC* missiles were maintained on stand-by, 24 hours a day, but never fired. The squadron test-fired the missiles at Eglin AFB, Florida on an annual basis for training purposes.

Above and Right: Operational deployment of the *BOMARC* in Canada involved the formation of two specialized Surface/Air Missile squadrons. The first, No. 446 SAM Squadron at RCAF Station North Bay, commanded and maintained control center for both squadrons. No. 447 SAM Squadron operating out of RCAF Station La Macaza, Quebec, activated on 15 September 1962. The squadron followed the same operational procedures as No. 446 Squadron. *BOMARC* was officially retired on October 1, 1972 and the remaining *BOMARC* missiles were used by all armed services as high-speed target drones. The *BOMARC A* and *BOMARC B* targets were designated as CQM-10A and CQM-10B.

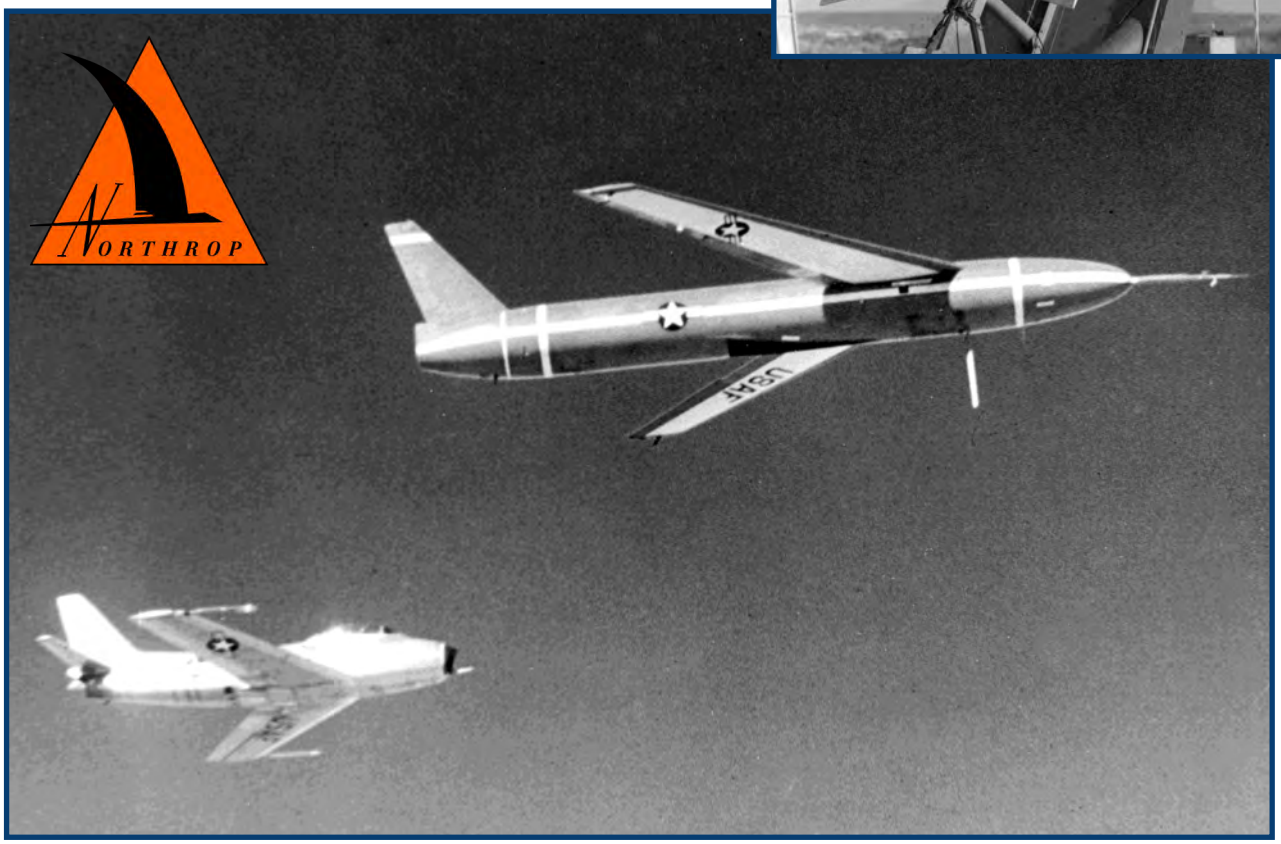
NORTHROP SNARK

MX-775, SSM-A-3, N-25, N-69, B-62, SM-62A



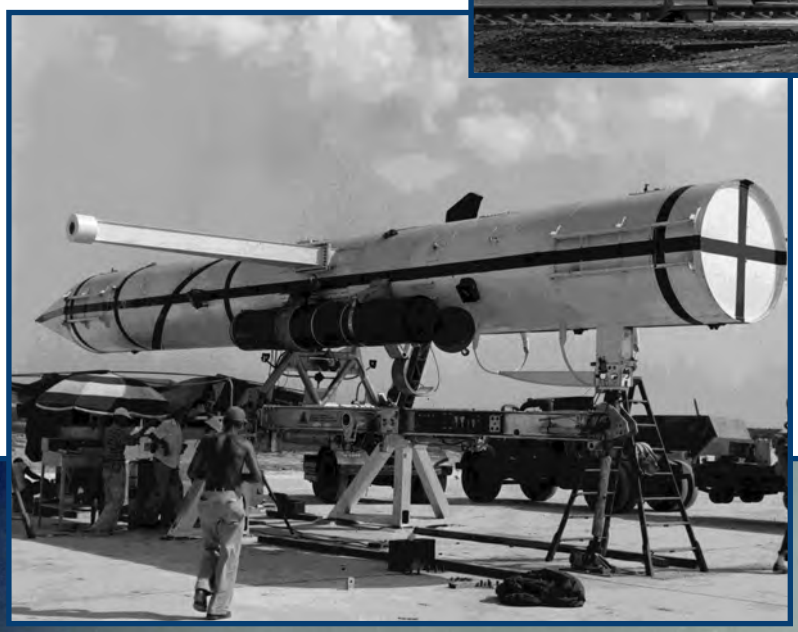
Above: The initial prototype for *Snark*, known as N-25, sits on the ramp at Holloman AFB, New Mexico.

Right: Technician D.A. Dereng examines the 1/10-scale model of Northrop *Snark* missile with Deacon booster at Wallops Island, Virginia on November 11, 1950.

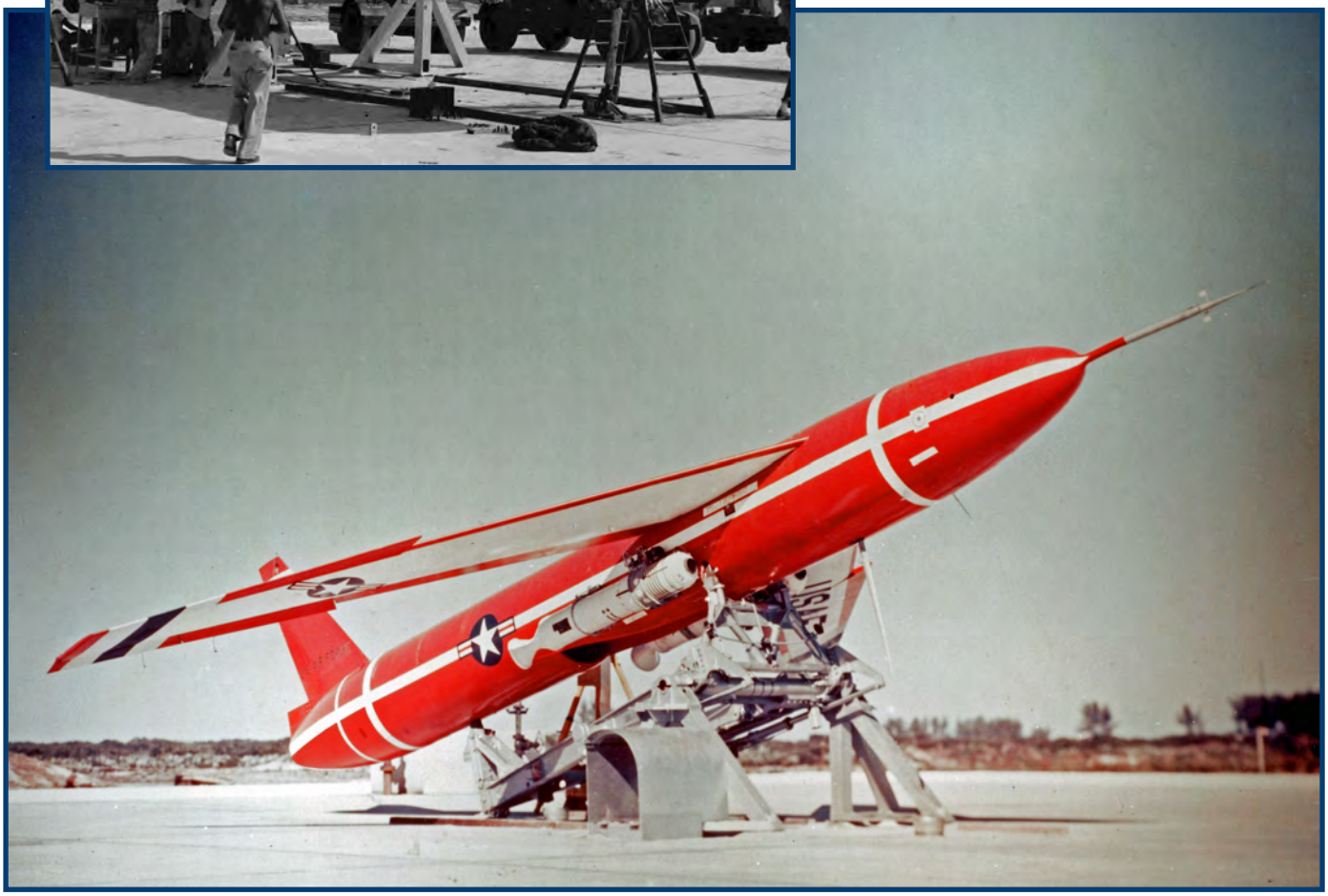


Above: Flight testing of the N-25 *Snark* took place over the White Sands missile test range after launching from Holloman AFB, New Mexico. Twenty-five flights with sixteen missiles reaching a max speed of Mach 0.9 with a max flight duration of 2 hours and 46 minutes.

Right: The N-25 *Snark* missiles were launched from the rocket sled track at Holloman before the zero-length launch boosters became available.



Left and Below: Northrop moved *Snark* testing to the Air Force Missile Test Center (AFMTC), Florida in the summer of 1952. Dummy *Snark's* were built in order to test the zero-length boosters before placing them on an actual missile. Four N-25 flights were conducted at the Cape prior to testing the larger N-69 variant.



All: The larger N-69 variant extended the fuselage length from 50 to 68 feet and the flying gross weight increased from 28,000 to 50,000 pounds. The flight testing of this version of *Snark* at the AFMTC began with its first flight occurring August 6, 1953.

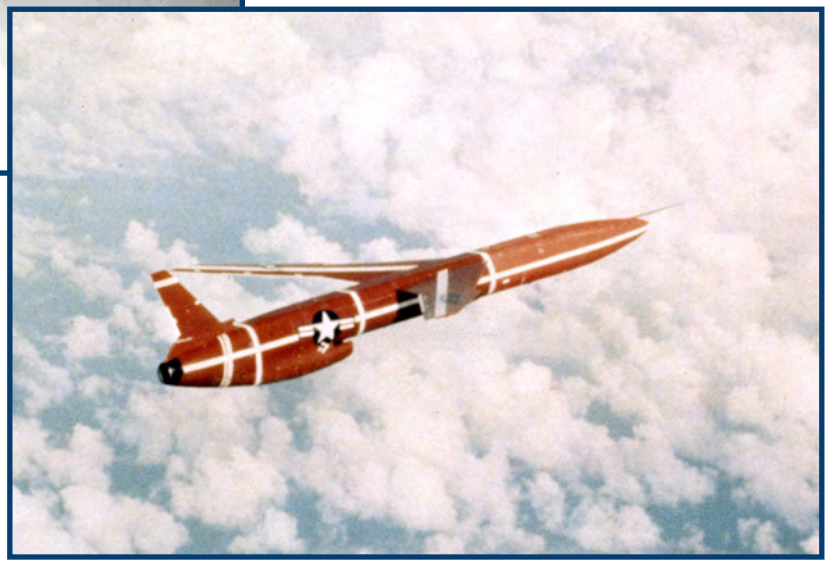
Left: The Northrop F-89 served as an inflight radio control for the N-69 *Snark* missile after booster release. The landing skids are shown extended as it approaches the Skid Strip at the AFMTC, Cape Canaveral, Florida.

Right: Landing a *Snark* safely at the Skid Strip could be a challenging affair as shown in this photo taken April 16, 1957. Despite the damage to the left wing, this missile was repaired and flown again.

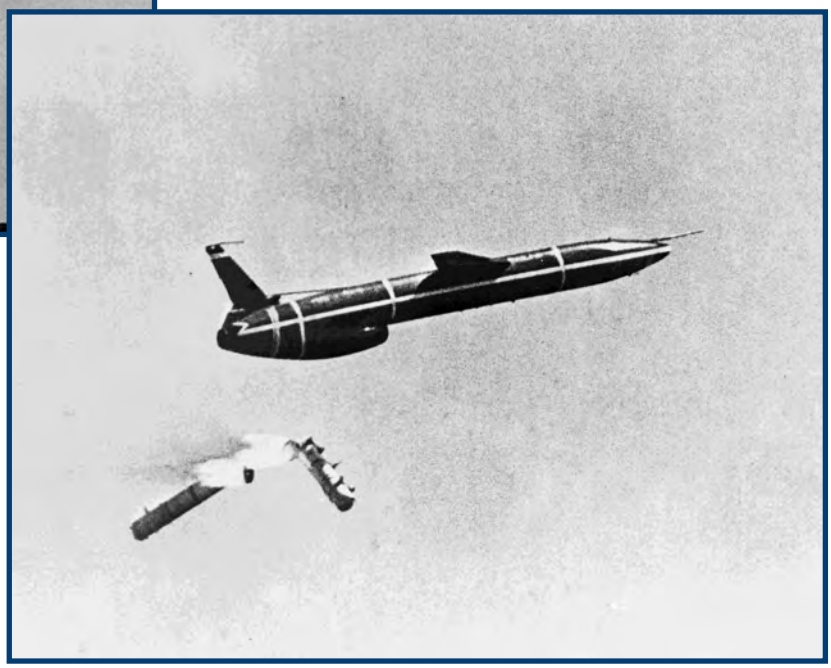
Left: No less than four N-69 *Snark* missiles can be seen in the AFMTC hangar on June 11, 1956.

Top: Strategic Air Command's nuclear deterrent force on display, the SM-62 *Snark*, SM-75 *Thor* and PGM-19 *Jupiter* missiles.

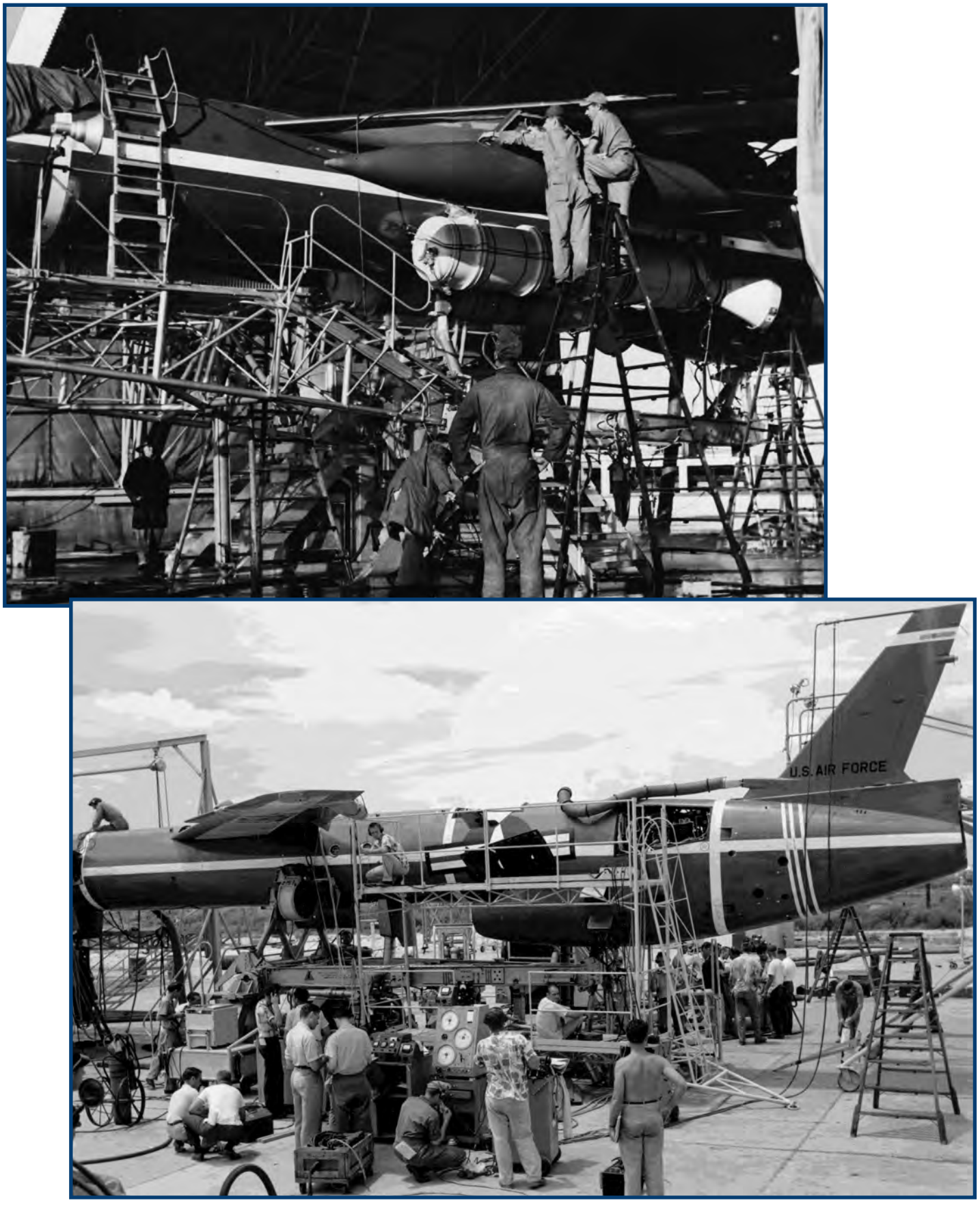
Middle: Night launches of the *Snark* could be quite dramatic.



Right: N-69 Snark in flight over the Atlantic Missile Range. Due to its high mission failure rate during early tests, personnel referred to the Atlantic test area as being '*Snark* invested waters'.



All: The *Snark* missile utilized two zero-length launch, solid-rocket boosters manufactured by Allegany Ballistics that produced 130,000 pounds of thrust for a total of 4 seconds to get the missile to a speed where the turbojet engine could take over before being jettisoned. The boosters contained small recovery parachutes and could be used for future launches.



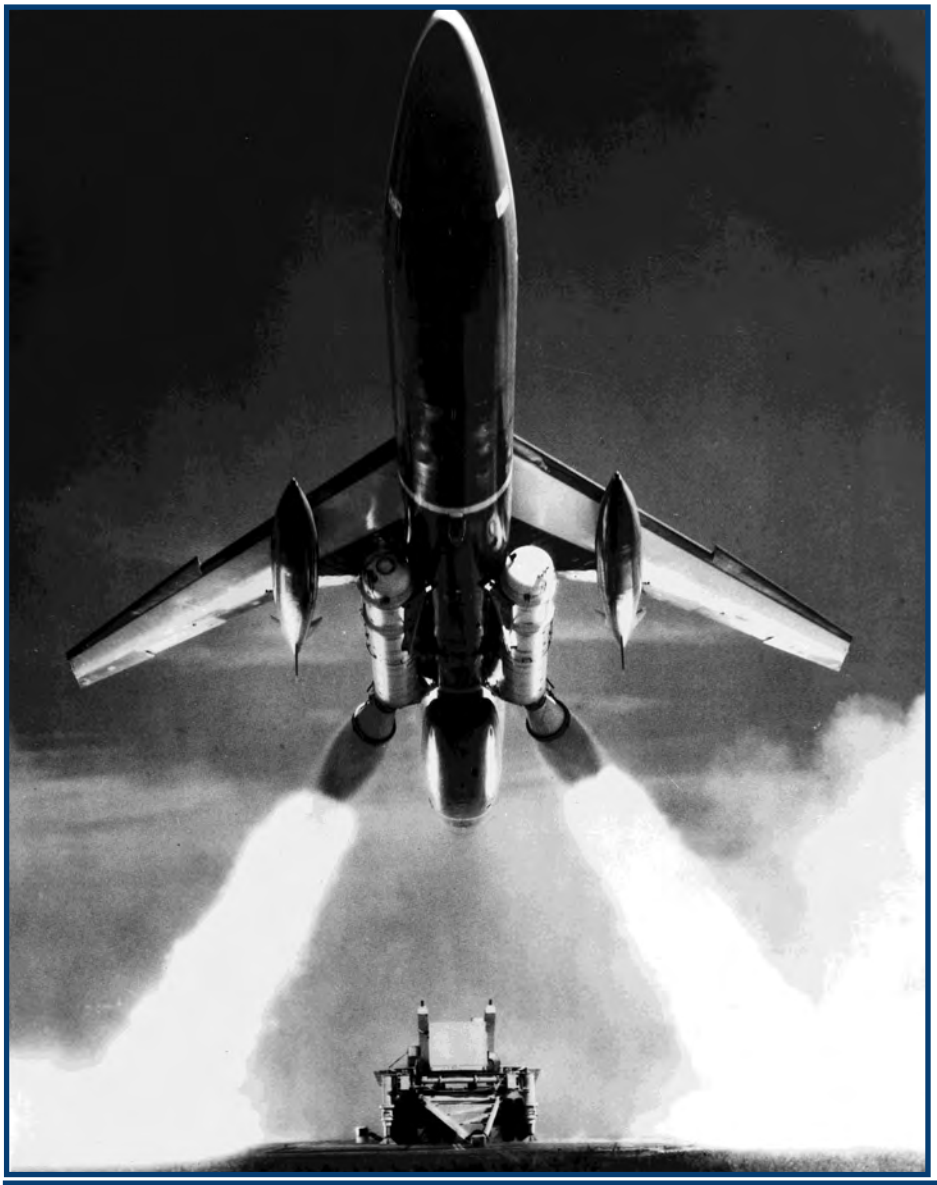
All: The early N-69 missiles were labor intensive to prepare for launch. A number of specialized technicians required for the warhead, avionics, powerplant, navigation and other systems of the *Snark*.

All: Initially powered by an Allison J71 turbojet, later *Snarks* upgraded to the Pratt & Whitney J57-P-3 and finally the J57-P-17 with 10,500 pounds of thrust.

Above: An SM-62 *Snark* is prepared for launch at the AFMTC on November 26, 1955.

Below: A unit of Convair F-102 *Delta Dagger* aircraft fly high over the Northrop SM-62 *Snark*.

Above: The first class of *Snark* "Missileairmen" graduated on Dec. 17, 1957. Left to right, SSgt. Maynard Denny (an honor student in that class); Lt. Col. Richard Beck, commander of the newly formed 556th Strategic Missile Squadron; Maj. Gen. Alfred Kalberer, deputy commander of the Fifteenth Air Force; and Whitley Collins, president of Northrop Aircraft.



Top Left: Clearly visible in this launch view are the external fuel tanks mounted on each wing of the SM-62 to extend its range.

Top Right: During the final phase of flight, the warhead section detached from the fuselage and continued onto the target while the rest of the missile pitched up and fell from the sky uncontrolled.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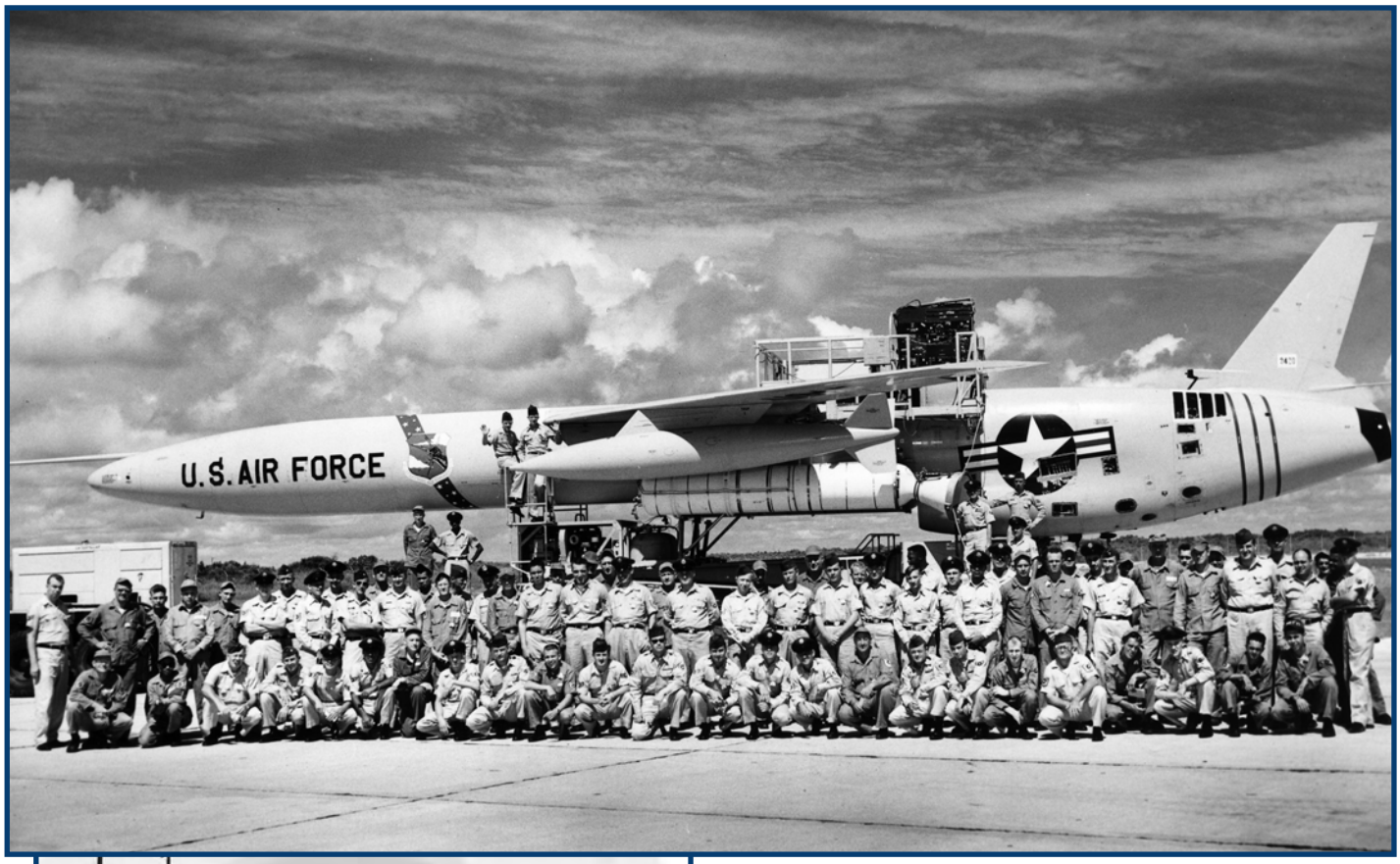
Pages 48 and 49: Northrop constructed five variants of the *Snark* for testing, the N-69A, B, C, D and E. The N-69A and B were performance testbeds and recoverable; the C model, a non-recoverable Warhead Delivery Test Missile; the recoverable N-69D tested the guidance system with the N-69E becoming the Operational Concept test missiles. With slight modifications, the N-69E became the operational SM-62A.



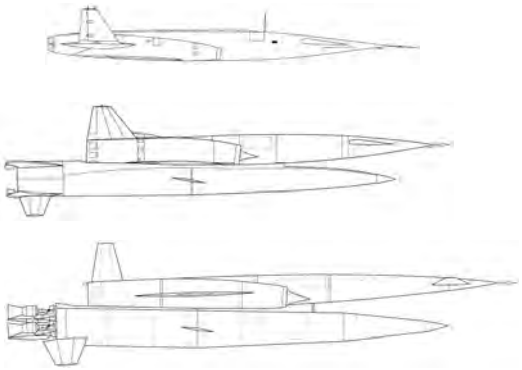
Above: Air Force personnel of the 702nd Strategic Missile Wing, Presque Isle Air Force Base, Maine pose with their *Snark*. The unit was declared fully operational in February 1961 and inactivated by President Kennedy just three months later on June 25. The remaining missiles were scrapped on site.

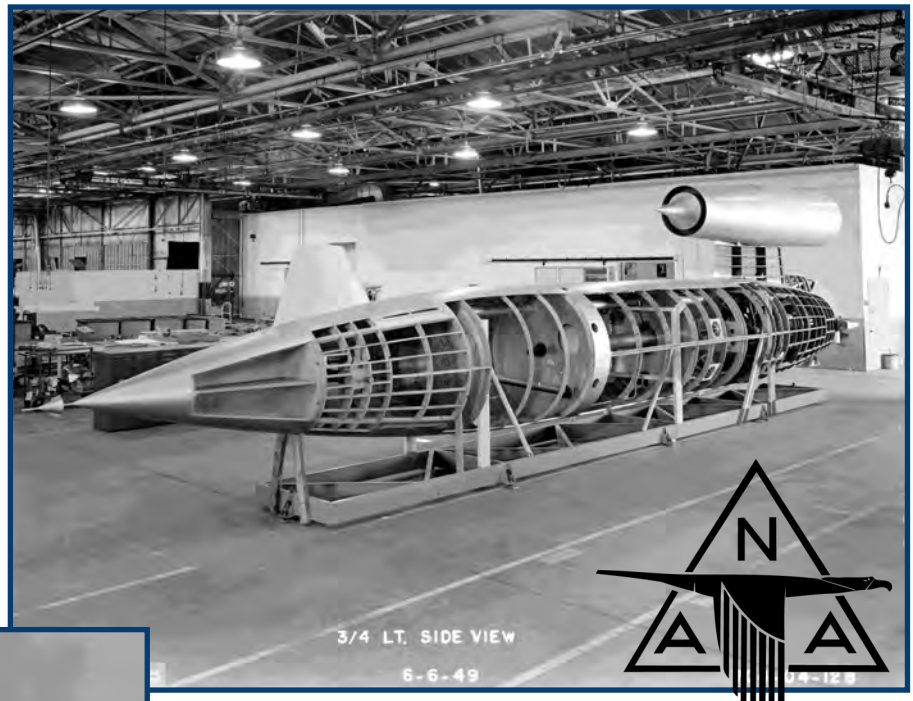
Left: Proposed configuration of the never-built XRSM-62A reconnaissance variant of *Snark*.

Right: A pristine example of the operational SM-62A *Snark* can be found in the Cold War gallery of the National Museum of the United States Air Force in Dayton, Ohio.

NORTH AMERICAN AVIATION NAVAHO

MX-770, NA-704, XSSM-A-2, XSSM-A-4, XSSM-A-6, RTV-A-5 ,
X-10, G-26, XB-64, G-38, XB-64A

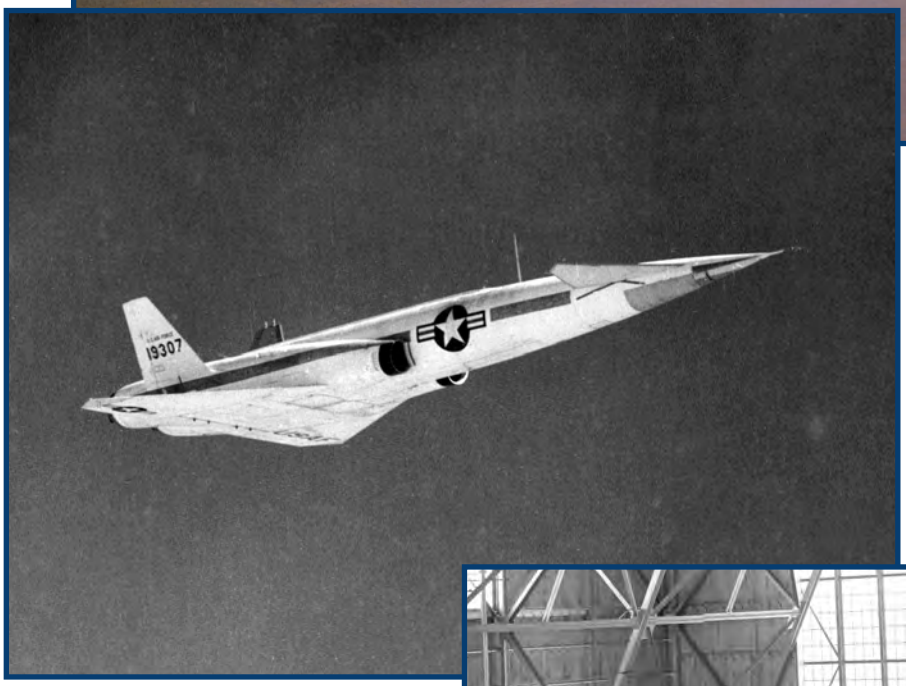




Right: One of the earliest *Navaho* designs to make it to the full-scale mockup stage, the NA-704. Though it didn't represent the final design, the mock-up layout is quite detailed.

Above: An MX-770 missile shape being prepared for launch aboard a sounding rocket at NASA Langley's Wallops Island test facility, Virginia.

Right (2): Early MX-770 designs proposed an air-launch capability using either the Convair B-36 *Peacemaker* or the Boeing XB-52 *Stratofortress*.



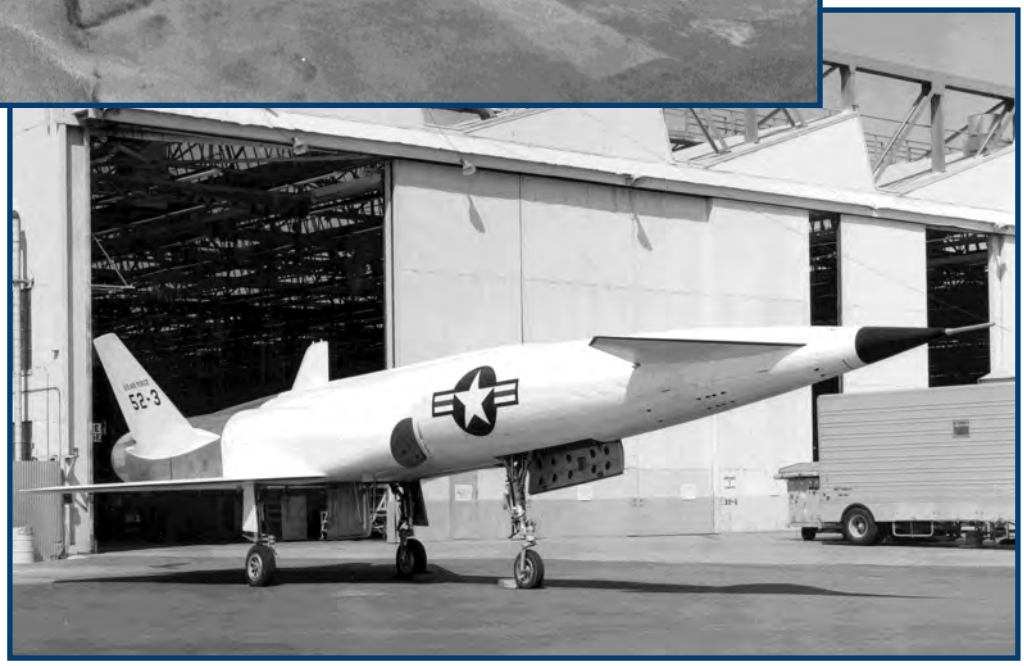
Above: The first X-10 *Navaho* vehicle parked on the lakebed at Edwards AFB shortly after arrival.

Left: Making its eighth and final flight, X-10 *Navaho,* 51-9307 would be the only one of its type to survive the flight test program.

Right: As more parts, supplies and vehicles arrived at Edwards AFB for testing, the hangar quickly became congested with little room to work.

Left: Many *Navaho* flights did not go according to plan. September 3, 1954, the first *Navaho* experiences landing gear issues and is forced to land gear up on the lakebed.

Middle: The fifth X-10 made its one and only flight on February 22, 1955. The vehicle destroyed when the parabrake deployed during landing approach.



Right: The final *Navaho* to fly, number 52-3, parked at the Air Force Missile Test Center (AFMTC), Cape Canaveral, Florida on September 17, 1958.

Above: The last two flyable X-10 missiles undergo modifications to become target drones for the *BOMARC* missile program.

Right: X-10 number 52-1 departs the AFMTC on February 3, 1956.

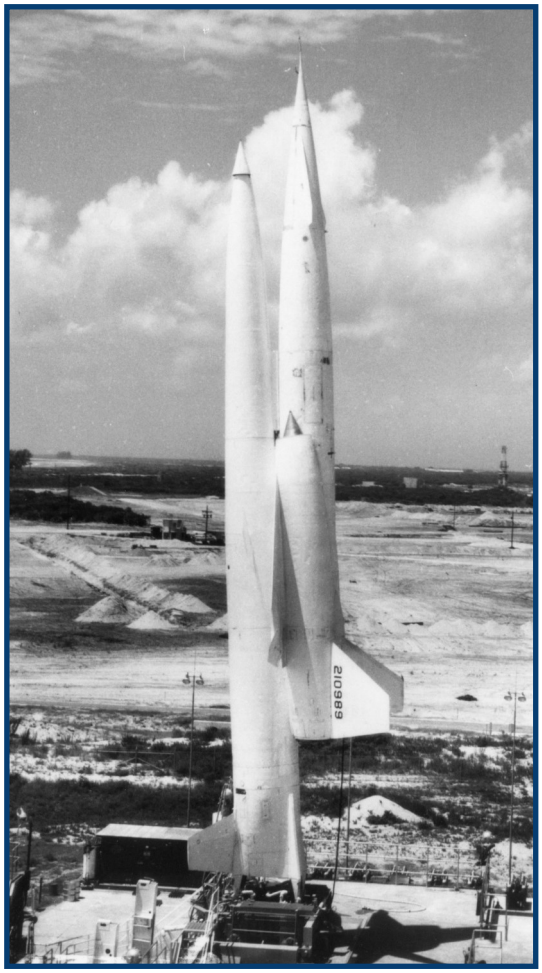
Below: X-10 mission markings applied to the ET-33 control aircraft.

Below Right: Mission markings and final salute painted on the first X-10 *Navaho* after its eighth and final flight.

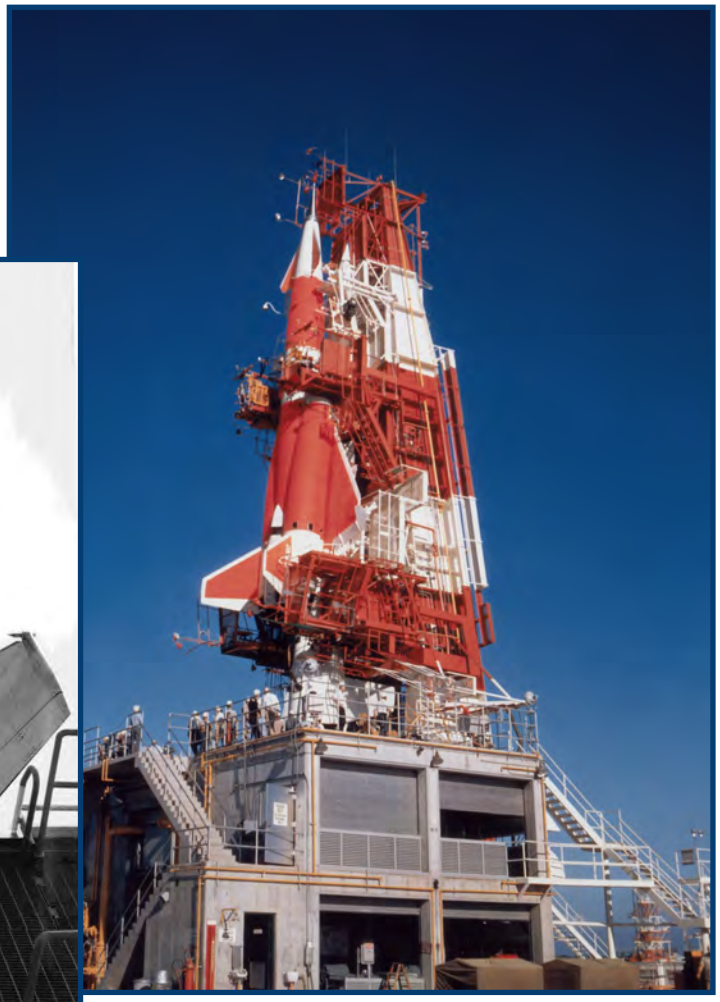
Left: Conceptual artwork showing an early Navaho missile design diving towards its intended target.

Below: The first G-26 *Navaho* undergoing a fit check with its liquid-fueled booster on April 19, 1957. The G-26 became designated as the XB-64 later in the program.

Below: The first complete *Navaho* test missile sits on the pad the AFMTC, Cape Canaveral, Florida on November 6, 1956.

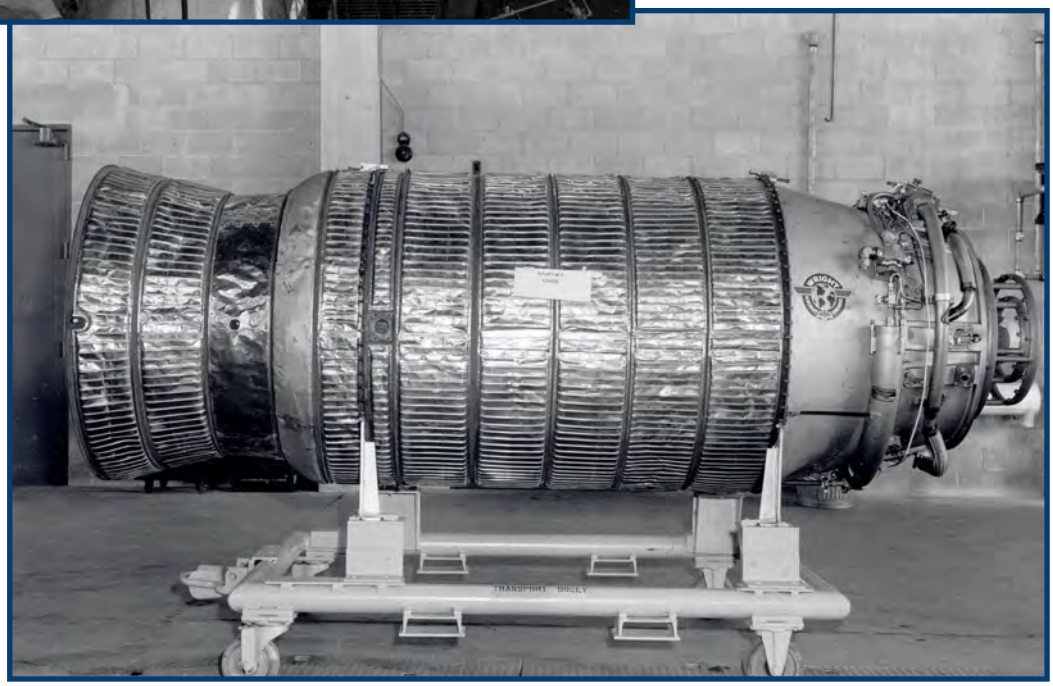


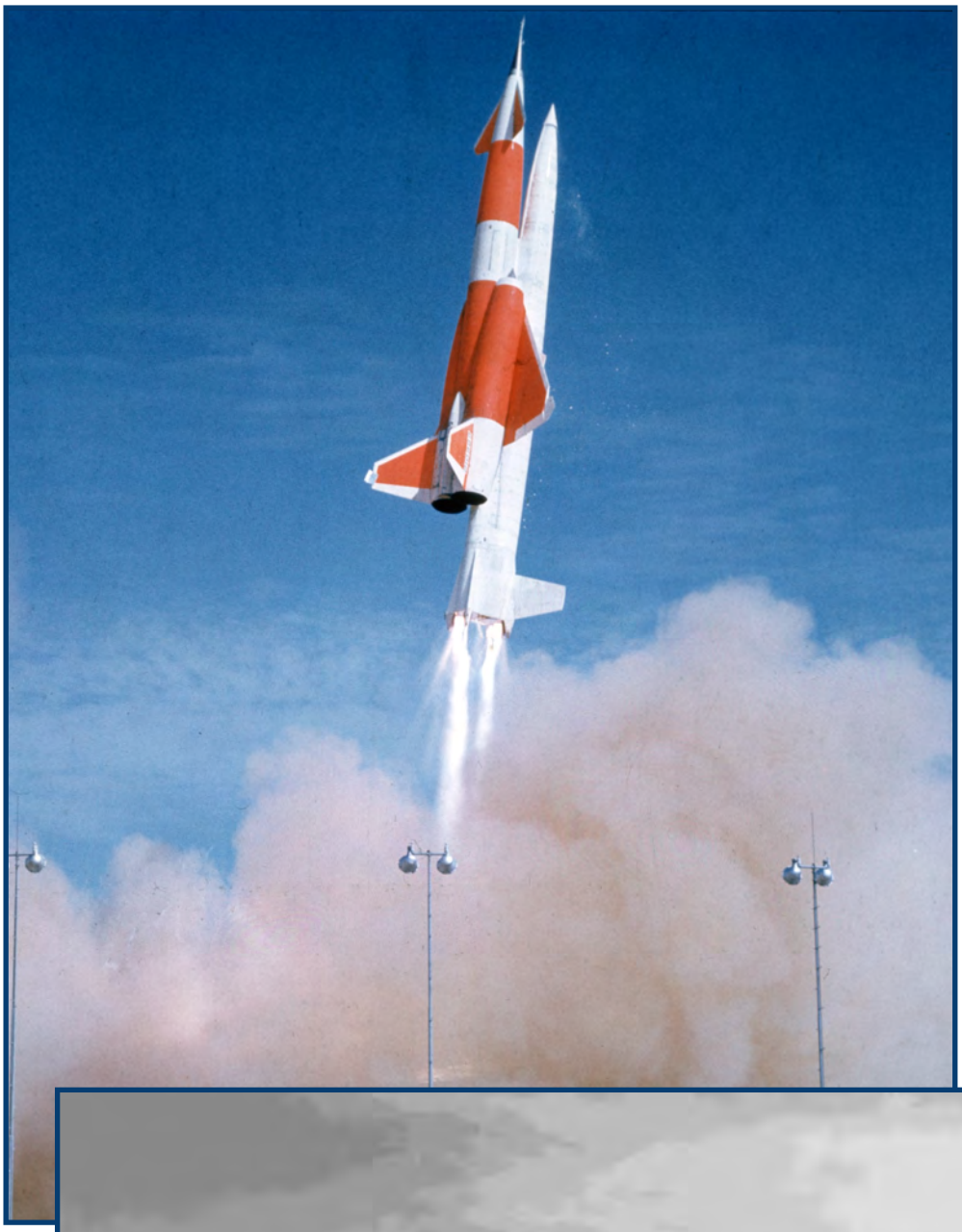
Above: Many of the XB-64 *Navaho* missile test vehicles were painted in bright color schemes to aid in long range tracking over the Atlantic Missile Range.



Above: An XB-64 undergoes final checkout prior to launch.

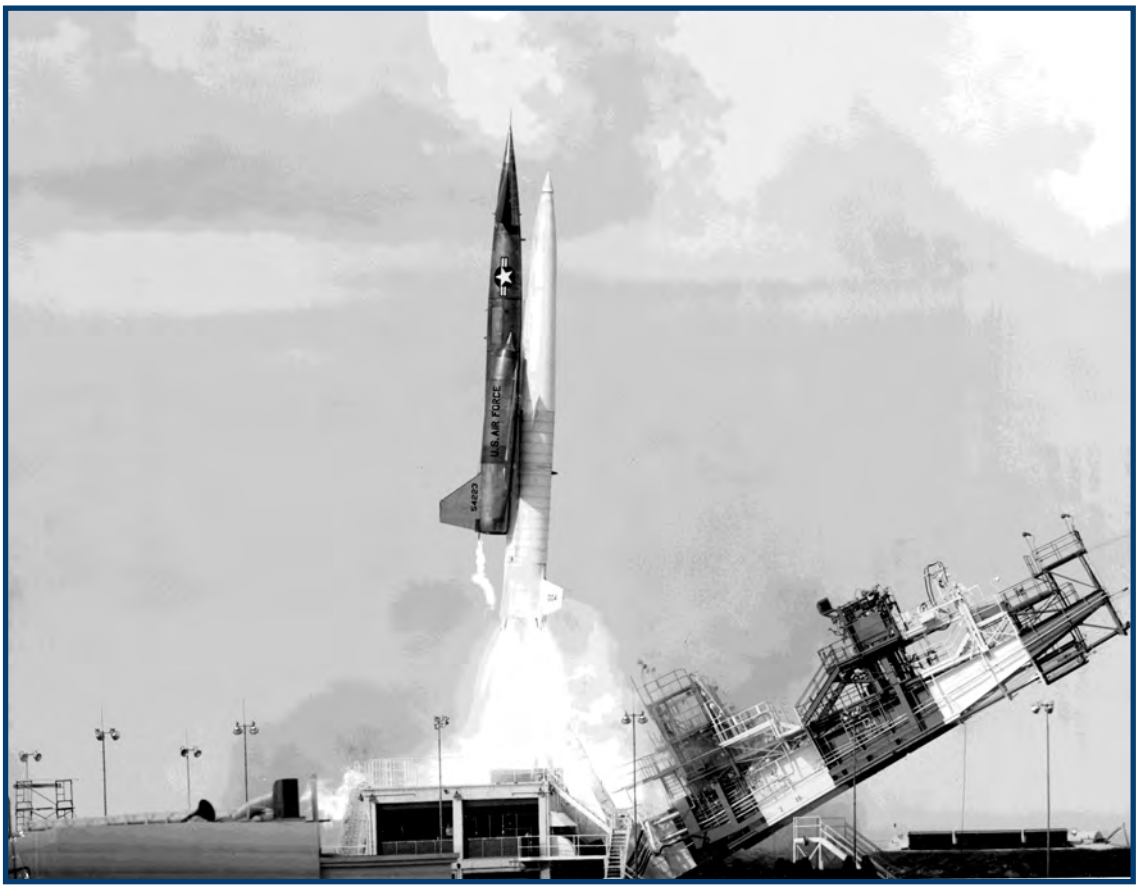
Left and Below: The G-26/XB-64 Navaho missiles utilized the Wright XRJ43-W-5 ram-jet engine for cruise flight.





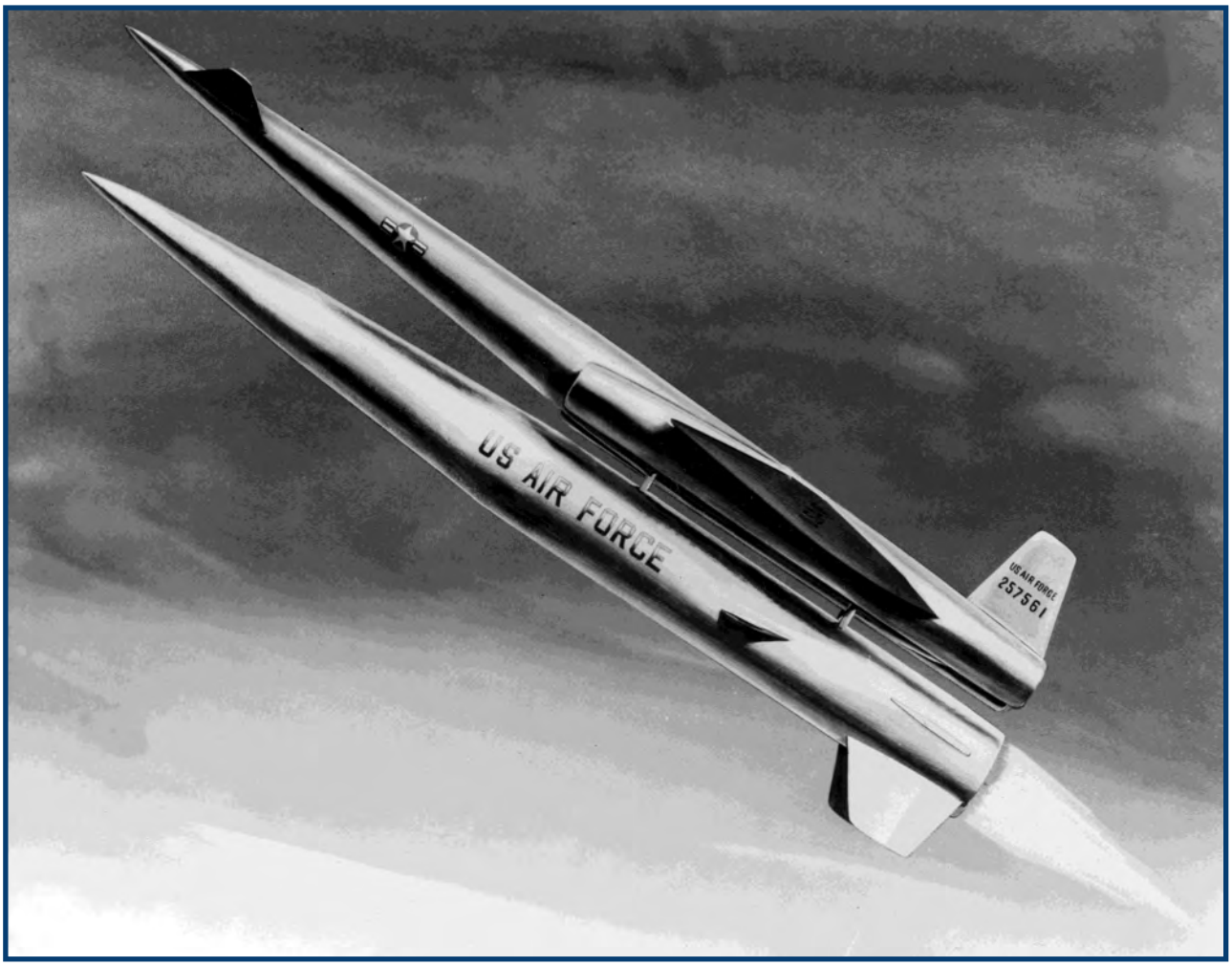
Left: The first G-26/XB-64 departs the AFMTC launch site on its very brief first flight. A pitch rate gyro had been installed backwards and the vehicle experienced severe pitch oscillations until it broke up 26 seconds into the flight. With the persistent failures, personnel coined the phrase 'Never Go Navaho'.

Below: Although the *Navaho* program had been terminated, the Air Force pitched the idea of using the remaining missiles as high-speed research vehicles under Project RISE (Research Into Supersonic Environment). Seven launches had been allocated but after the second failed attempt, the project was terminated.



Left: With the red & white launch gantry moved out of the way, XB-64 *Navaho,* 55-4223, departs on the next to last flight during a Project RISE mission. This mission ended in failure when a fuel system malfunction prevented ramjet ignition.

Left and Above: The second, and last, flight of a *Navaho* for Project RISE ended in failure when the vehicle broke up at 77,000 feet.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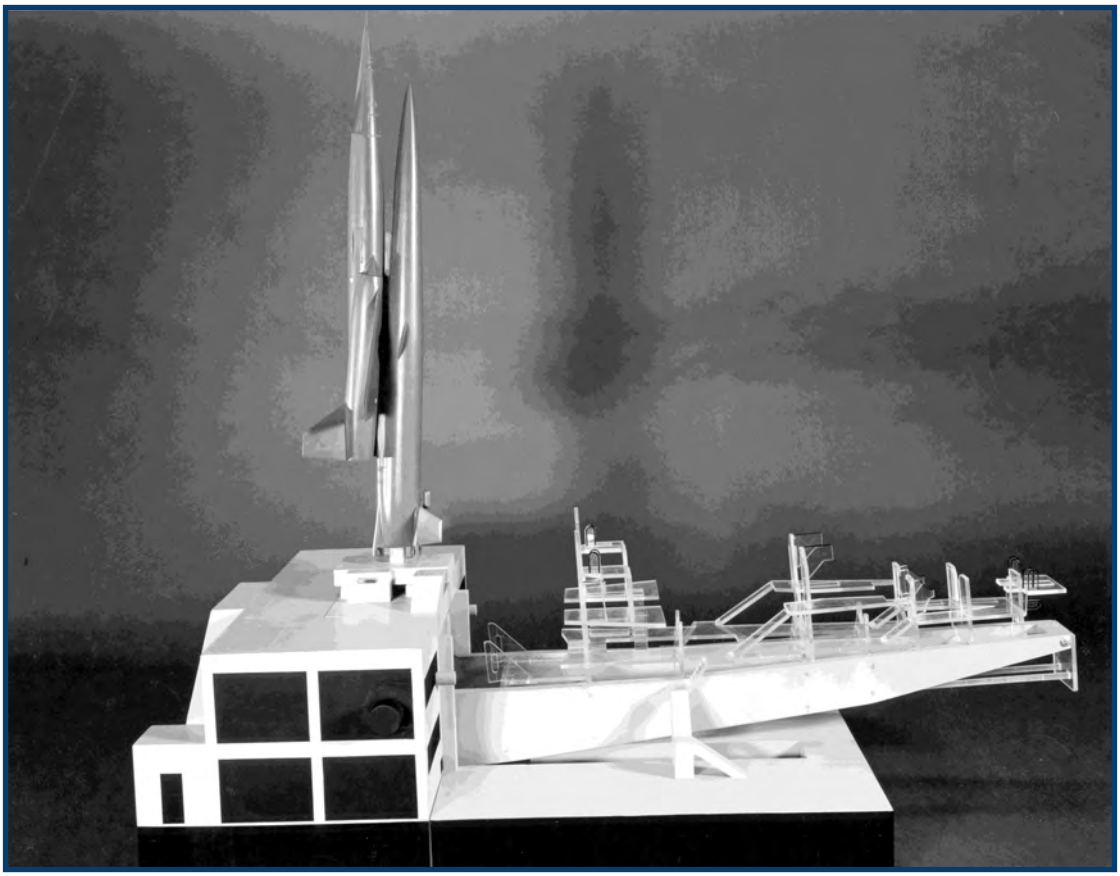
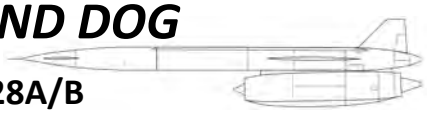
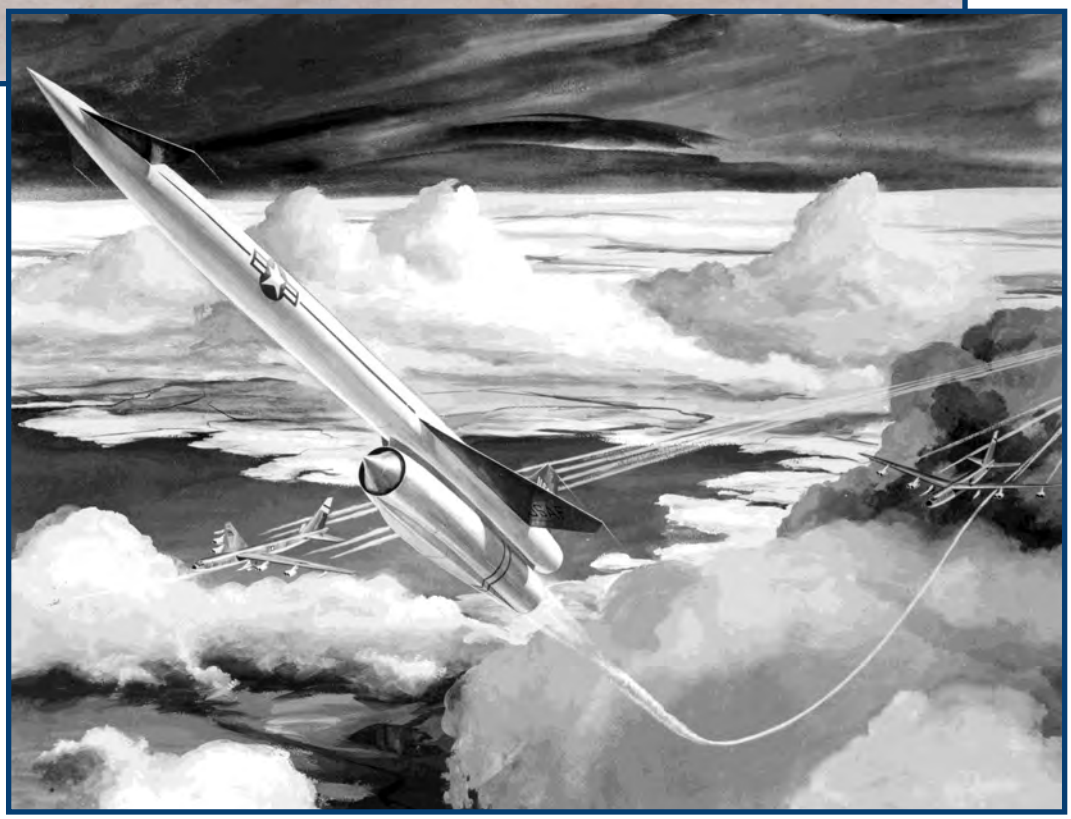


Pages 60 and 61: Progress on the operational G-38/XB-64A *Navaho* missile system had been making good progress by the time of program termination. Much of the subsystem hardware had been completed including the ramjet engines and at least one liquid-filled booster. The vehicle itself never made it past the full-scale mockup shown below. Concept models built show the missile could have been launched from fixed outdoor sites or placed inside hardened shelters similar to those used for the *BOMARC*.

NORTH AMERICAN AVIATION HOUND DOG



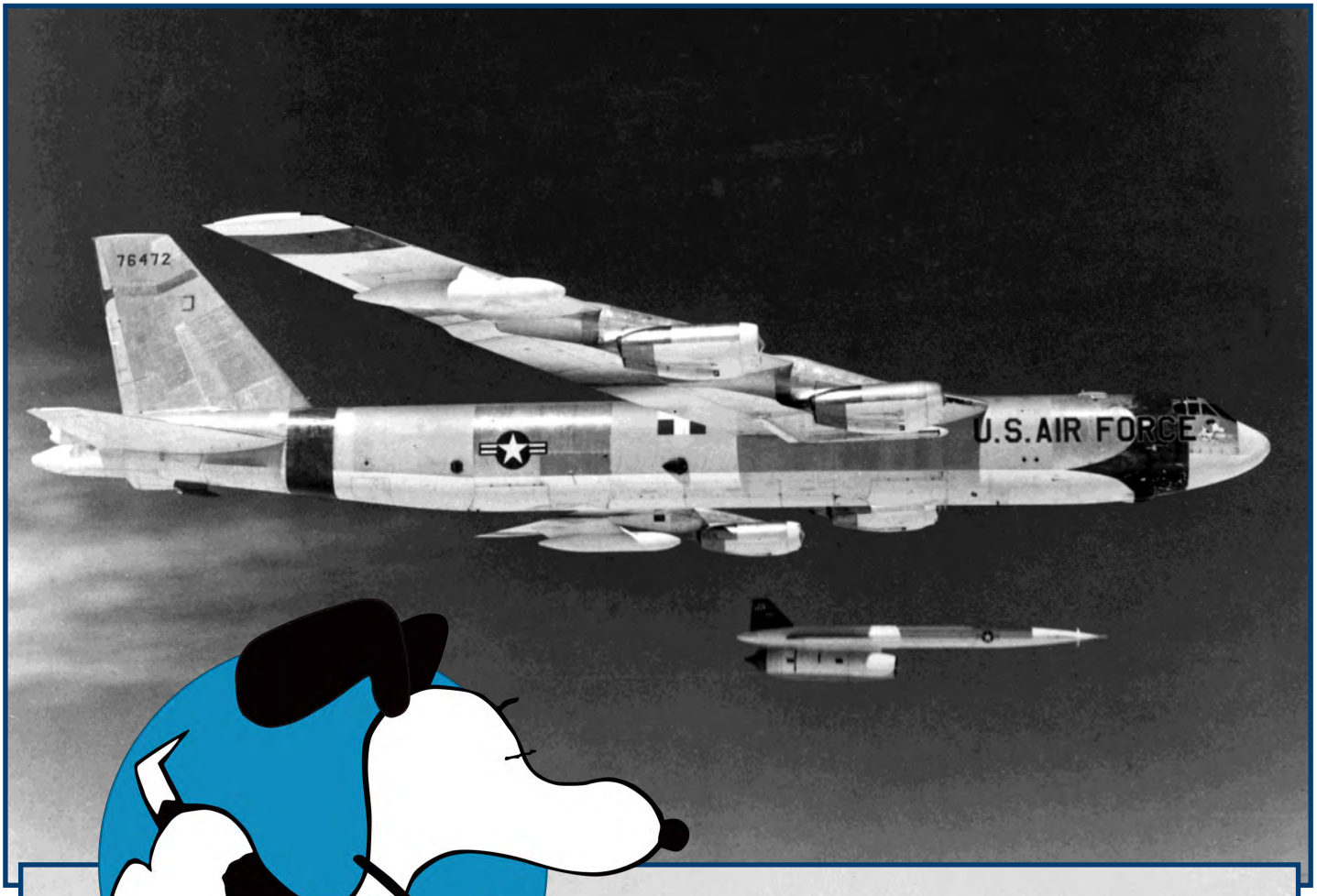
WS-131B, B-77, GAM-77, GAM-77A, AGM-28A/B



Above and Right: In 1958, North American Aviation won the contract to build a new air-to-surface missile carried under the wings of a Boeing B-52 *Stratofortress*. Named after the hit song by Elvis Presley, the supersonic *Hound Dog* had an operational range of 785 miles.

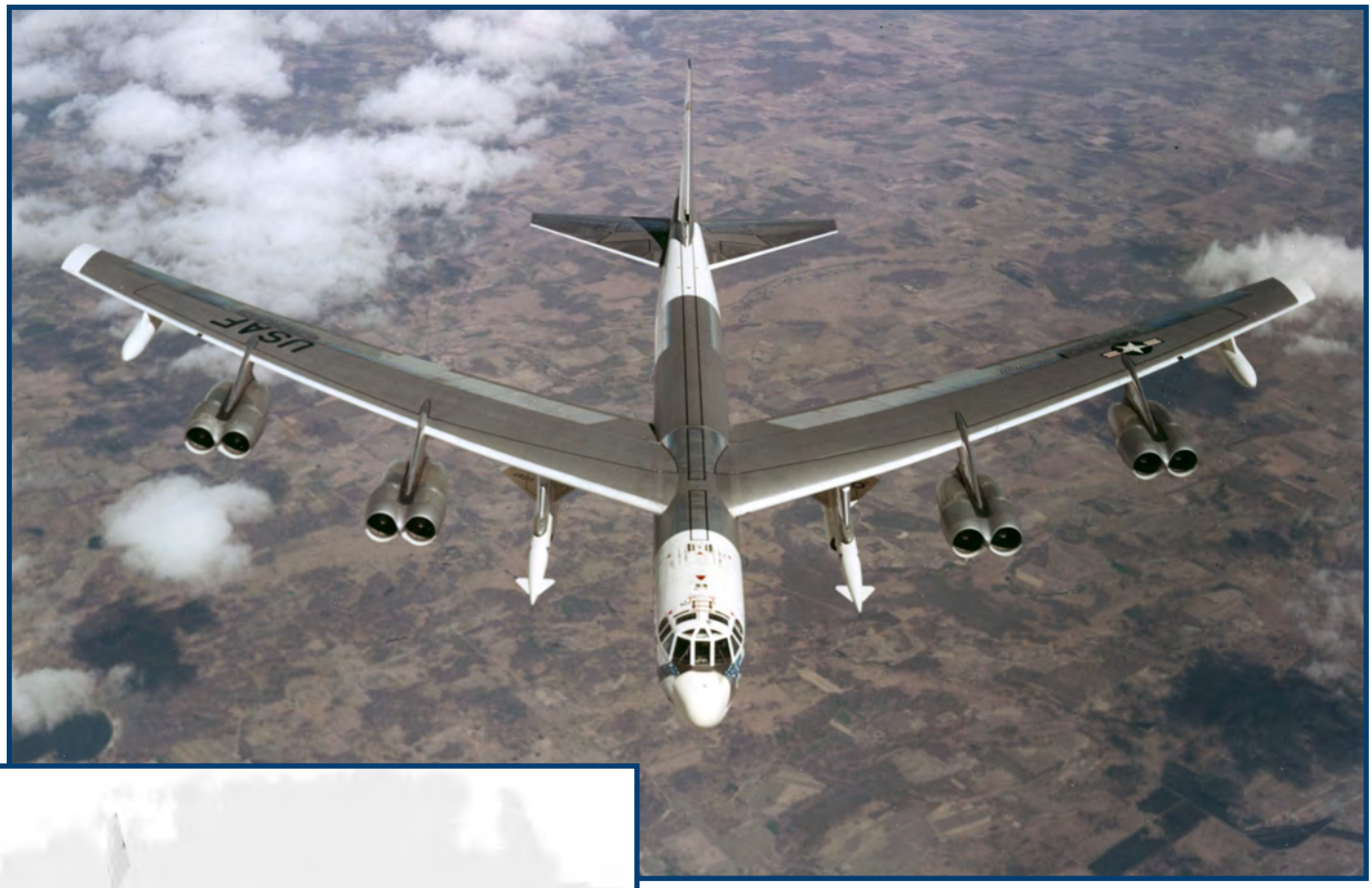
Top: Initial testing for the *Hound Dog* missile occurred at White Sands Missile Range, New Mexico prior to moving to the Air Force Missile Test Range (AFMTR) at Cape Canaveral, with operational testing done at Eglin AFB, Florida.

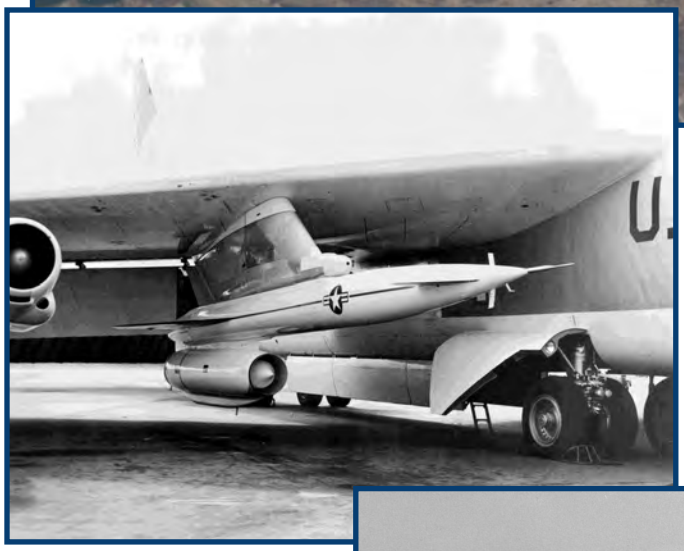
Above: The first *Hound Dog* training missile under the wing of a B-52 *Stratofortress*.



Top: A GAM-77 *Hound Dog* is launched over the Air Force Missile Test Range, Eglin AFB. Barely visible on the nose of B-52G, 57-6472, is the GAM-77 nose art.

Above: *Hound Dog* missile hangs from the wing of the third B-52H off the assembly line, 60-0003, at Edwards AFB, CA on May 5, 1962. This B-52H is still in operational service.

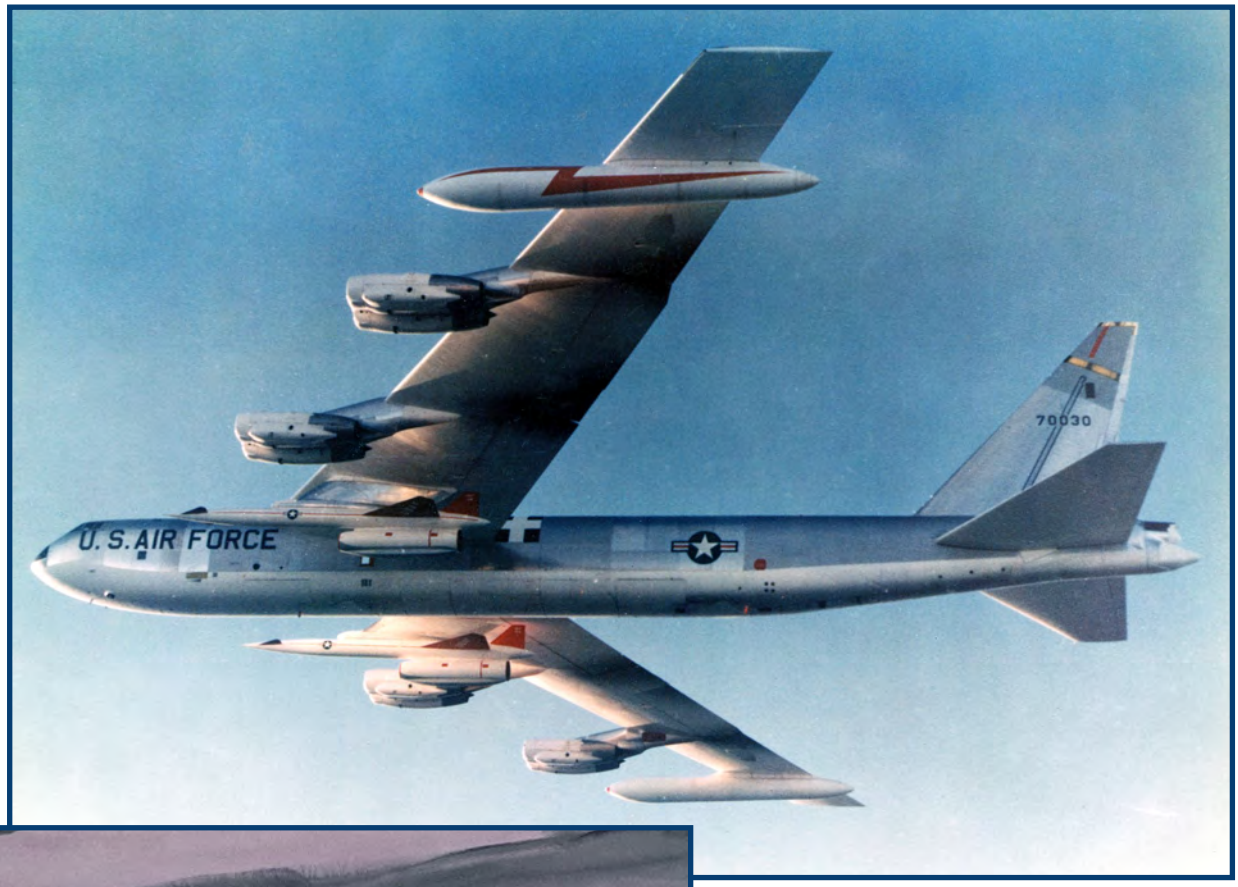




Above: During operational missions, the B-52 *Stratofortress* carried a single GAM-77 *Hound Dog* missile under each wing.

Left: *Hound Dog* missiles were powered by a single Pratt & Whitney J52-P-3 turbojet engine with 7,500 pounds thrust.

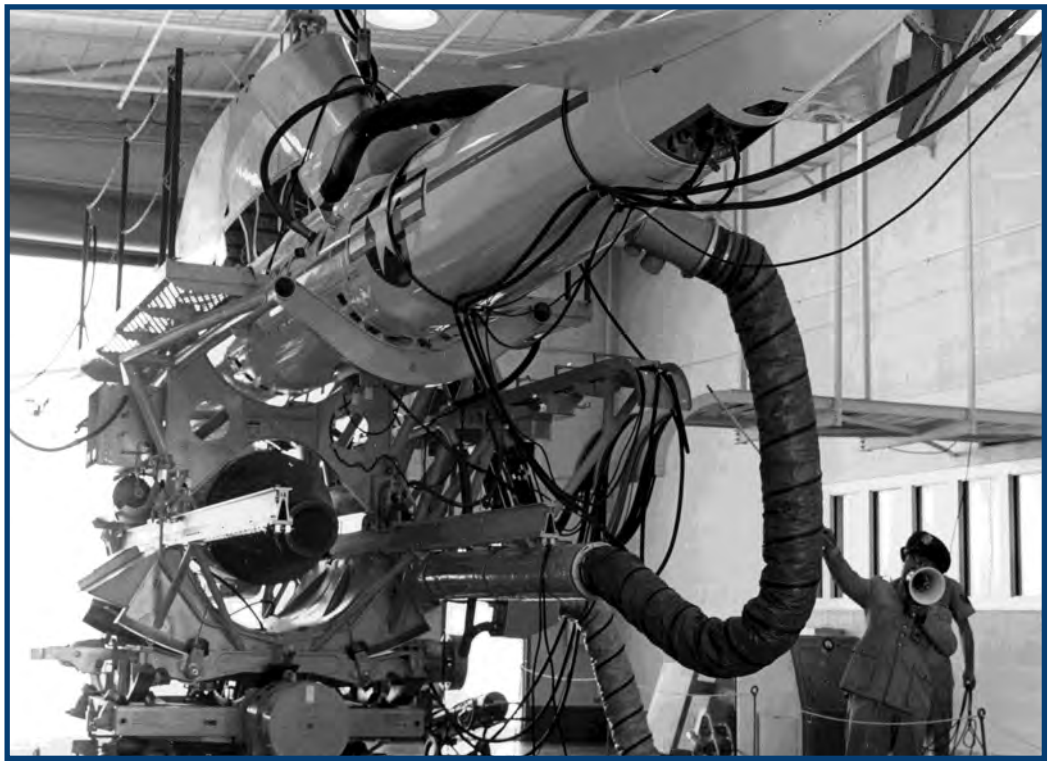
Right: The mobile transport carts for *Hound Dog* are also used for mounting the missile to the B-52 and contained folding walkways for maintenance personnel.



Top: Operational *Hound Dog* missiles carried a W28 Class D nuclear warhead and could be preset to detonate on ground burst (impact) or air burst at a preset altitude.

Left: Artist impression of how the missiles could be programmed to attack two separate targets hundreds of miles apart.

Right: Strategic Air Command (SAC) developed procedures in 1960 for using the *Hound Dog's* J52 engine as additional thrust for the B-52 to get the bombers further away from their bases in case of attack. The missiles would be refueled in flight from the wing tanks of the B-52.



Above: This image of a *Hound Dog* laden B-52 taken by A2C Don Holsombek became SAC's Photo of the Year in 1963.

Left: A *Hound Dog* missile mounted in the "Rock and Roll" test stand at Beale AFB, CA, September 6, 1961.

Top: *Hound Dog* missiles hang from each wing of these B-52F *Stratofortress* aircraft as they sit alert in 1967.

Above: Air Force personnel of the 390th Airborne Missile Maintenance Squadron (AMMS) stationed at Bergstom AFB, TX pose with a *Hound Dog* missile in 1965.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Above: GAM-77 *Hound Dog* cruises over White Sands Missile Range, NM. Depending on the mission, missiles could fly as low as 200 feet or as high as 56,000 feet.

Left: Members of a Strategic Air Command bomber crew scramble to get their B-52 airborne during an alert test.

Above: A North American Aviation GAM-77 *Hound Dog* and McDonnell GAM-72 *Quail* decoy missile are transported to airshows across the country in order to give the American public a glimpse of the latest technology used by the United States Air Force.

Right: The GAM-77 designation changed to AGM-128A, while the GAM-77A changed to AGM-128B in June 1963.

Left: With smoke billowing from the eight, water-injected Pratt & Whitney J57-P-43WA engines, this B-52F with two AGM-128 *Hound Dog* missiles departs its base to remain on airborne alert.

Right: Static engine run on the *Hound Dog's* J52 turbojet. Note the FOD cover placed over the intake on the missile to protect the engine from damaging debris.

Top: A sight the enemy never wanted to see headed their way, a Boeing B-52 *Stratofortress* carrying *Hound Dog* cruise missiles.

Above: The depot at Tinker AFB, OK had responsibility for depot-level maintenance on all AGM-128 *Hound Dog* missiles.


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Left: After fifteen years of service, the *Hound Dog* missiles were removed from service and placed in storage at Aircraft Maintenance and Regeneration Center (AMARC), Davis-Monthan AFB, AZ awaiting final disposal orders.

Above: Towards the end of the program, the remaining *Hound Dog* missiles were given a low-visibilty camouflage paint scheme.

Right: A fine example of the AGM-128B *Hound Dog* can be found at the National Museum of the United States Air Force, Dayton, OH.

The author would like to offer special thanks to the Boeing Historical Archives for their assistance with information and archival imagery contained in this photo retrospective.

Additional Reading:

Online:

TAC Missileers Website: www.TACMissileers.org

Boeing Product History: www.Boeing.com/history/products

Air Force Materiel Command History Office: www.afmc.af.mil/History

National Museum of the United States Air Force: www.nationalmuseum.af.mil

Publications:

Bill Yenne; "U.S. Cruise Missiles"; Specialty Press, 2018

James N. Gibson; The Navaho Missile Project; Schiffer Publishing Ltd, 1996

Dennis R. Jenkins & Tony R. Landis; Experimental & Prototype U.S. Air Force Jet Fighters; Specialty Press, 2008

Margaret C. Bagwell, Historian; History of the BOMARC Weapon System, 1953 to 1957; Historical Division, Air Materiel Command, February 1959

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